THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LIX. No. 1504.] LONDON, MARCH 8, 1892. [44TH YEAR. PRICE 6d.

GAS AND WATER PIPES.

1¼ to 12 IN. BORE.

THOMAS ALLAN & SONS,
Bon Lea Foundry,
SOUTH STOCKTON-ON-TEES.

ALSO MANUFACTURERS OF
SANITARY & RAIN-WATER PIPES, HOT WATER PIPES, STABLE FITTINGS, RANGES, STOVES, And GENERAL CASTINGS.

GLASGOW OFFICE: 24, GEORGE SQUARE.
Telegrams:
"BONLEA, STOCKTON-ON-TEES."
"SPRINGBANK, GLASGOW."

— ESTABLISHED 1830. —
PARKER & LESTER,
Manufacturers & Contractors.

THE ONLY MAKERS OF
PATENT ANTIMONY PAINT,
Parker's Imperial Black Varnish,
Oxide Paints, Oils, and General Stores for Gas and Water Works.

WORKS:
ORMSIDE STREET, OLD KENT ROAD,
LONDON.

WOLSTON'S
TORBAY PAINTS
Special Quotations to Gas Companies.
DARTMOUTH, DEVON.

CEMENT
EARLE'S
BEST
Portland Cement
MANUFACTURED BY
GEO. & THOS. EARLE,
HULL.

Offices: 7, 8, & 9, PIER STREET.
Works: WILMINGTON.
STOREAGE CAPACITY 10,000 Tons.

ESTABLISHED 1811—OVER THREE QUARTERS OF A CENTURY.
Telegraphic Address: "CEMENT HULL."

REDUCE THE COST OF PURIFICATION

By taking up 40 per cent. Carbonic Acid, 50 per cent. Sulphuretted Hydrogen, diminishing Sulphur Compounds, and removing all Ammonia and Tar,

BY THE USE OF

C. & W. WALKER'S
PATENT
PURIFYING MACHINE.

THE STATEMENTS OF VARIOUS GAS MANAGERS ARE—

"*Your Machine will clear itself in five years.*"
"*My Purifiers last as long again since your Machine was put in.*"
"*I have saved hundreds of Tons of Lime per annum since your Machine was started.*"
"*I use your Machine for the removal of CO_2. I am therefore able to save one-half of my original quantity of Lime.*"
"*Your Purifying Machine is not only a Purifying Machine in name but in Work.*"
"*Your Purifying Machine is doing 50 per cent. more than you guaranteed it to do.*"

It has proved itself by many years of work at Gas-Works. Among many others, they are in use at—

London (4).	Glasgow (2).	Wakefield.	Santiago.
Cheltenham.	Burnley.	Hornsey.	Colne.
Blackpool.	Northampton.	Mirfield.	Stafford.
Crystal Palace.	Stalybridge.	Dunfermline.	Bournemouth.
Harrogate.	Widnes.	Alloa.	Melbourne.
Stone.	Church.	Leeds (2).	Monte Video.
	Birmingham.	Brussels.	

MIDLAND IRON-WORKS, DONNINGTON, NEAR NEWPORT, SHROPSHIRE,
And 10, Finsbury Square, London.

SAWER AND PURVES,

LATE

FLETCHER AND MURPHY,

GARRATT STREET WORKS, OLDHAM ROAD, MANCHESTER,

Manufacturers of

IMPROVED CONSUMERS' WET GAS-METERS

IN CAST-IRON CASES,

THE UNVARYING WATER-LINE GAS-METER,

AND

IMPROVED DRY GAS-METERS.

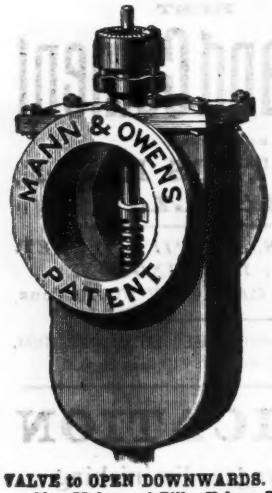
SPECIALITY: PATENT CASH PREPAYMENT METERS.

S. OWENS & CO., Hydraulic, Gas, & General Engineers, WHITEFRIARS ST., LONDON, E.C.

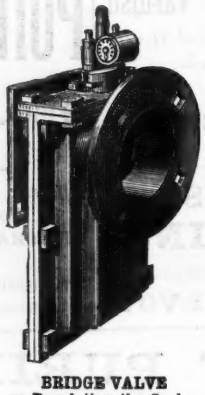
SOLE MANUFACTURERS OF

MANN & OWENS' PATENT SCREW & CAM, also FULL-WAY RACK & PINION GAS-VALVES.

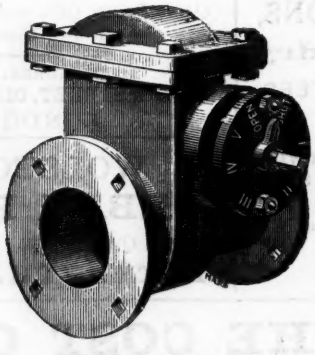
REDUCED IN PRICE.



VALVE to OPEN DOWNWARDS.



BRIDGE VALVE
or Regulating the Seal
of Hydraulic Mains.



FULL-WAY RACK AND
PINION VALVE.

VALVE to OPEN UPWARDS.

Also Makers of Pillar Valves, Self-acting Bye-pass Valves, Outside Rack and Pinion Valves, Hydraulic Main-Valves, Disc-Valves, and Special Valves of all kinds. Improved Gas-Exhausters, Steam-Engines, Steam-Cranes, Boilers. Blake's Patent Steam-Pumps for Tar, Water, and Ammoniacal Liquor, Hydraulic Coal-truck Lifts, Hydraulic Cranes, Hydraulic Apparatus for Lifting Purifier-Covers, and every description of Pumping Apparatus, &c., suitable for use in Gas-Works, made to order.

S. O. and Co.'s New Catalogue of Gas Apparatus and General Machinery can be had on application.

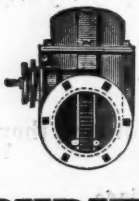
NEWTON, CHAMBERS, & CO., LIMITED

THORNCLIFFE IRON-WORKS, near SHEFFIELD,

MANUFACTURERS OF

SLIDE VALVES,
WITH RACK & PINION,
OR
Internal or External
SCREWS, of all Sizes.

GASHOLDERS,
AND
Gasholder Tanks.



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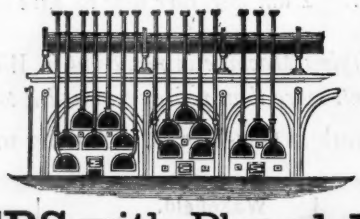
RETORT-BED FITTINGS,

And Retort-House Appliances

of every description.

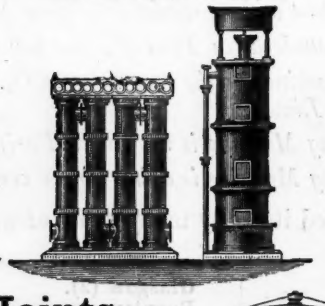
Iron Roofs, Columns, Girders, Floor Plates and Tools, &c.



WROUGHT AND CAST IRON

CONDENSERS,
SCRUBBERS, & WASHERS,

TAR AND LIQUOR PUMPS, &c.



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CENTRE VALVES

for working Purifiers.

Also Bye-Pass & Stop Valves.

PURIFIERS with Planed Joints,

HAND and HYDRAULIC LIFTING GEAR, CAST-IRON MAINS and SPECIALS,

WOOD GRIDS.

CAST AND WROUGHT IRON TANKS AND CISTERNS.

DESIGNS, SPECIFICATIONS, AND ESTIMATES FREE.

Pig Iron (*Special Quality*) for ENGINE CYLINDERS, &c.

GAS COAL FAMOUS FOR ITS UNRIVALLED EXCELLENCE.

THE BARROWFIELD IRON-WORKS, LIMITED,

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GAS ENGINEERS AND CONTRACTORS,

Telegrams: "GASOMETER GLASGOW."

GLASGOW.

GAS APPARATUS OF EVERY DESCRIPTION.

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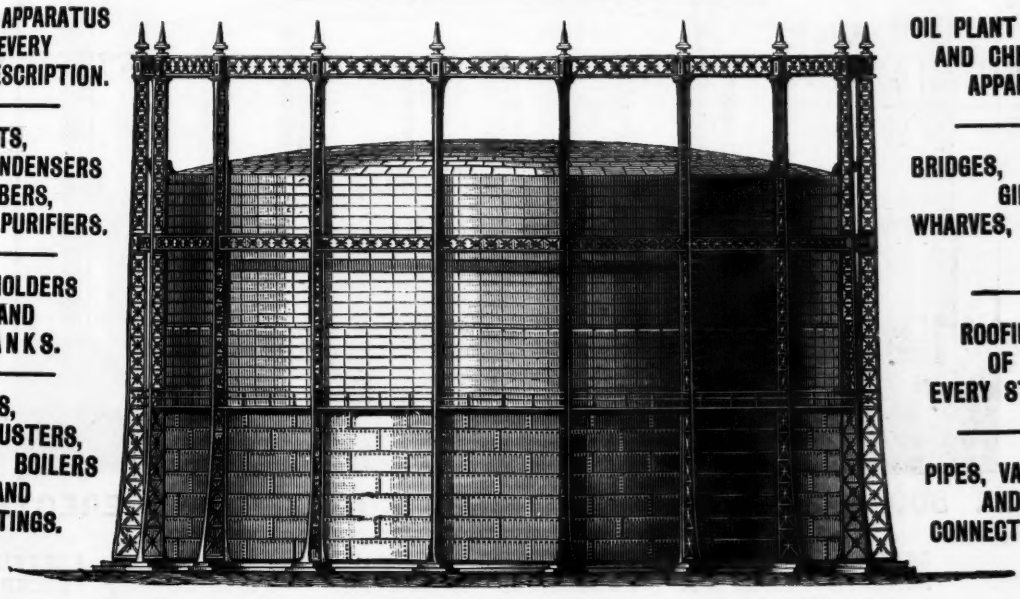
GASHOLDERS AND TANKS.

ENGINES, EXHAUSTERS, STEAM BOILERS AND FITTINGS.



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BRIDGES, GIRDERS WHARVES, PIERS.

ROOFING OF EVERY STYLE.

PIPES, VALVES, AND CONNECTIONS.

London Office: 6, LITTLE BUSH LANE, CANNON STREET.

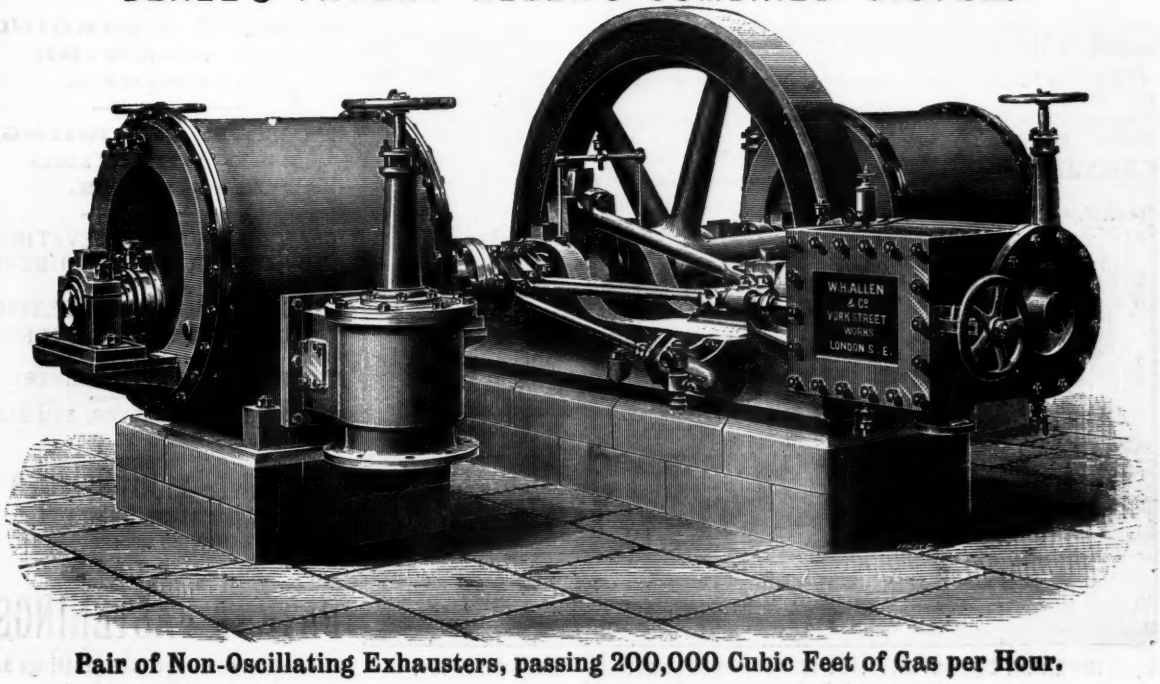
W. H. ALLEN & CO.,

York Street Works, LAMBETH, LONDON, S.E.,

MAKERS OF THE MOST IMPROVED FORM OF

GAS EXHAUSTING MACHINERY.

BEALE'S PATENT—ALLEN'S COMBINED SYSTEM.

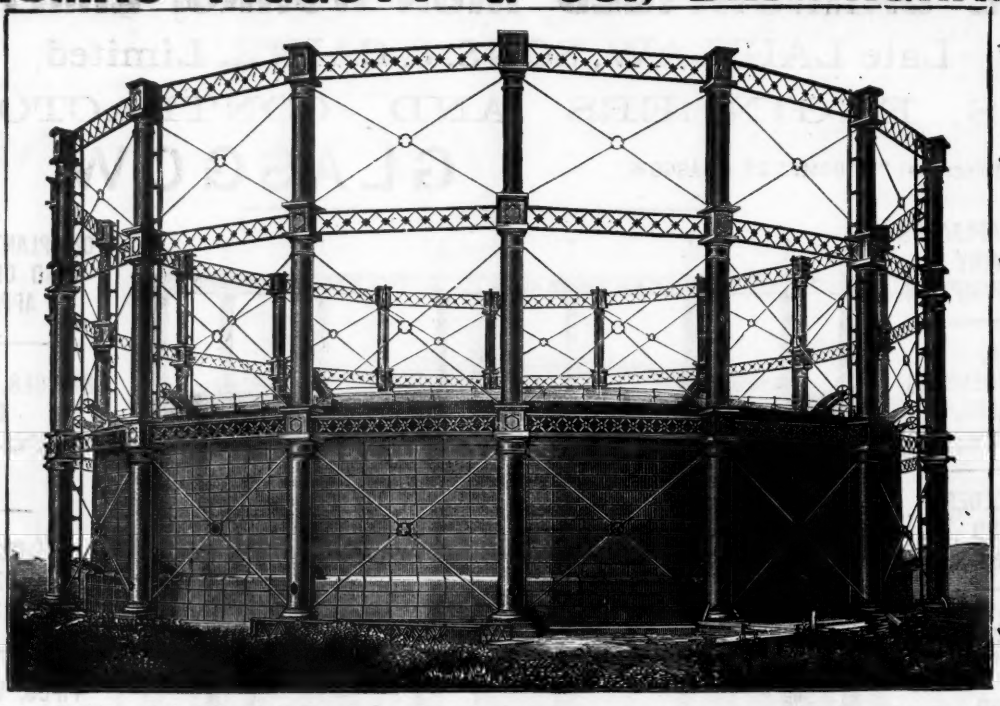


Pair of Non-Oscillating Exhausters, passing 200,000 Cubic Feet of Gas per Hour.

THOMAS PIGGOTT & CO., BIRMINGHAM.

LONDON OFFICE: ST. THOMAS APOSTLE, E.C.

GAS PLANTS, BOILERS, ENGINES, PUMPS, ROOFS, RETORT FITTINGS, ETC.



TELEGRAPHIC ADDRESS: ATLAS, BIRMINGHAM.

WELDED & RIVETED FOUL PIPES, MAINS, RETORT-LIDS, WROT & CAST TANKS, PURIFIERS.

OVER 500 GASHOLDERS HAVE BEEN SUPPLIED AND ERECTED,

INCLUDING THOSE SUPPLIED TO THE FOLLOWING GAS COMPANIES AND CORPORATIONS:

BATH.	BOLTON.	BRISTOL.	CHELTENHAM.	LEAMINGTON.	PRESTON.	SHEFFIELD.
BELFAST.	BOMBAY.	BRISBANE.	HARTLEPOOL.	LIVERPOOL.	READING.	STOCKHOLM.
BECKTON.	BRADFORD.	CARDIFF.	LEEDS.	NOTTINGHAM.	RIO GRANDE.	SYDNEY.
BIRMINGHAM.	BRIGHTON.	COVENTRY.	LEICESTER.	OLDHAM.	SOUTH METRON.	VIENNA.

WEST'S GAS IMPROVEMENT Co., Ltd.,

(Mr. JOHN WEST, M. Inst. C.E., *Managing Director*),

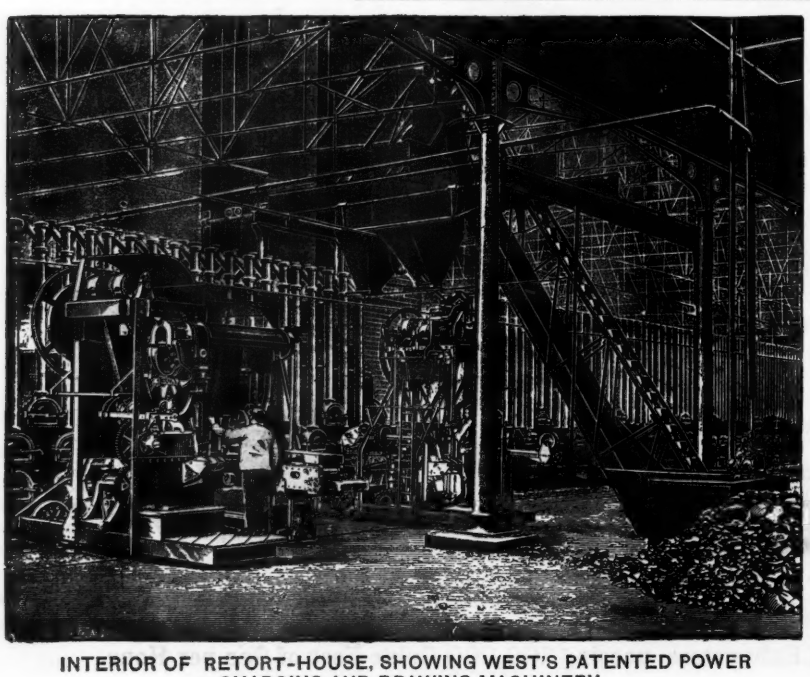
Engineers, Ironfounders, and Contractors,

ALBION IRON-WORKS, MILES PLATTING, MANCHESTER,

Manufacturers of

WEST'S PATENTED MACHINERY FOR CHARGING AND DRAWING GAS-RETORTS.

OVER **180** MACHINES AT WORK AND IN COURSE OF CONSTRUCTION.



INTERIOR OF RETORT-HOUSE, SHOWING WEST'S PATENTED POWER CHARGING AND DRAWING MACHINERY.

MANUAL CHARGING AND DRAWING MACHINES.

POWER CHARGING AND DRAWING MACHINES.

COAL BREAKING, ELEVATING, AND CONVEYING MACHINERY.

COKE BREAKING, CONVEYING, AND WASHING MACHINERY.

OXIDE ELEVATING MACHINERY.

COKE BARROWS, VALVES, AND ALL GAS-WORKS PLANT.

RETORT MOUTHPIECES

WITH SELF-SEALING LIDS,

FITTED WITH

KING'S

PATENT FASTENINGS.

N.B.—The whole of these Fittings are made of Wrought Iron.

JOSEPH CLIFF & SONS,

INCORPORATED IN
THE LEEDS FIRE-CLAY COMPANY, Ltd.,
WORTLEY, LEEDS.

LONDON Offices & Depôts:
Baltic Wharf, Waterloo Bridge.
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MACHINE-MADE RETORTS

Have been made in large quantities for the last twelve years; and during the whole of that time, have been in regular use at most of the largest Gas-Works in the Kingdom. They possess the excellent quality of remaining as near stationary as possible under the varying conditions of their work—a quality which will be appreciated by all Gas Engineers and Managers. The generally expressed opinion is that these Retorts are the very best that are made.

RETORTS CAREFULLY PACKED FOR EXPORT.

Fire-Bricks, Lumps, Tiles, &c., &c., of every description suitable for Gas-Works.

ESTABLISHED MORE THAN A QUARTER OF A CENTURY

WORKS
HUNSLET.
LEEDS

LONDON OFFICE:
60, QUEEN VICTORIA STREET
E.C.

CLAYTON SON & CO. LTD.

MAKE A

SPECIALTY OF

GASHOLDERS

AND MAKERS OF

REG? TELEGRAPHIC ADDRESS: "GAS LEEDS"

GAS PLANT OF EVERY DESCRIPTION.

THE WIGAN COAL & IRON CO., LIMTD.,

Are exclusive Owners of the well-known HAIGH HALL & KIRKLESS HALL GAS COAL COLLIERIES, and supply the Best Wigan Arley Mine Gas Coal, Gas Nuts, Gas Cannel, Cannel Nuts, &c.

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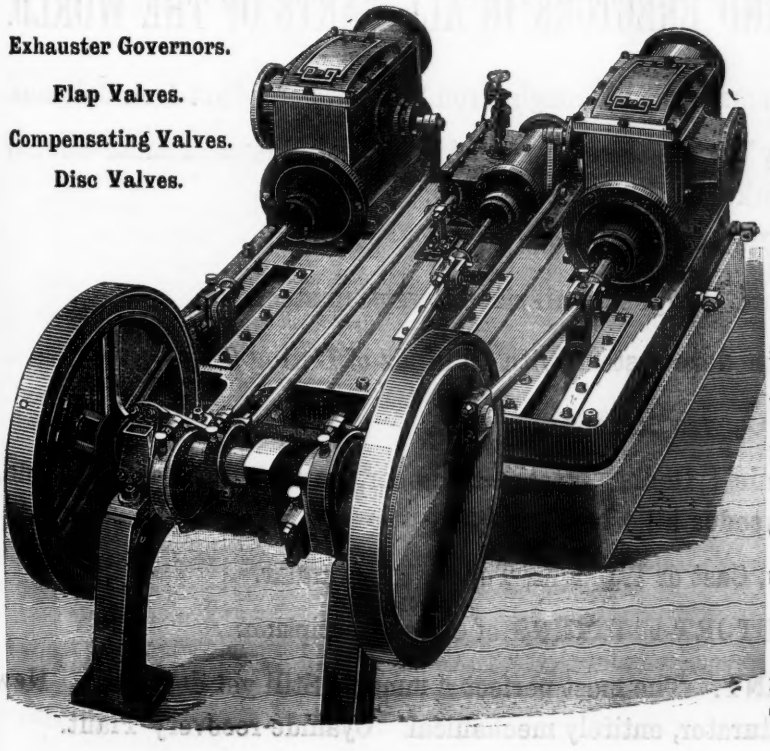
LONDON DISTRICT OFFICE: 6, STRAND, LONDON—C. PARKER & SON, SOLE AGENTS.
TELEGRAPHIC ADDRESS: "PARKER LONDON."

R. & J. DEMPSTER,

Engineers, Ironfounders, and Contractors,

GAS PLANT WORKS, NEWTON HEATH, MANCHESTER.

Exhauster Governors.
Flap Valves.
Compensating Valves.
Disc Valves.



GAS EXHAUSTERS.

COMBINED

Steam-Engine and Double-Cylinder

RECIPROCATING

GAS EXHAUSTERS.

These Exhausters work without oscillation, keeping a perfectly steady gauge.

They will force against the highest pressures without slip.

They are substantial in design. The working parts are finished bright, and are provided with large wearing surfaces to ensure durability, and being external, they are easily got at for repairs.

They are very economical in the consumption of steam.

The workmanship and materials are of the highest class.

They are made in all sizes, from 2000 feet per hour upwards.

Three of these Exhausters recently made by us are passing 60 million cubic feet of Gas per day.

Telegrams:
"Gastoves," Warrington.

TEMPORARY LONDON OFFICES & SHOW-ROOMS: 65 & 66, BASINGHALL STREET, E.C.
Winners Nelson Test, June 2, 1891; Nottingham Medal, Nov. 28, 1891.

GAS COOKING RANGES
Richmond & Co Limited
GAS FIRES
Heating Stoves
WATER HEATERS
BOILING BURNERS
GAS ENGINEERS

WARRINGTON & LONDON.
E. W. T. Richmond, Managing Director. Sole Agents for Webb's Lamps.

Heating-Stoves and Gas-Fires.

BEST VALUE IN THE TRADE. MANY SPECIALITIES.

Best for Hiring-Out. No Sheet-Iron Parts.

SEND FOR LIST.

SEASON 1892. NEW IMPROVEMENTS TO COOKERS. RICHMOND'S PATENT WHITE ENAMELLED STEEL CROWN PLATE NOW ADDED AT LOW PRICE.

No. 30, 2/-. | No. 40 & 50, 2/6. | No. 100, 3/-. | No. 120, 3/6. | No. 140, 4/-. | No. 160, 5/- sub.

Wrought-Iron

And Fittings and Accessories.

LAMBERT BROS., WALSALL,

MANUFACTURERS OF
WROUGHT-IRON TUBES & FITTINGS for GAS, WATER, & STEAM,
BRASS GAS-FITTINGS, GAS-VALVES, STEAM & WATER VALVES, TOOLS, &c.; AND OF
WARNER'S PATENT MARKET GAS STAND-PIPE.
LONDON: LAMBETH BRASS & IRON CO., Short Street, LAMBETH.

ASHMORE, BENSON, PEASE, & CO., LIMITED,

STOCKTON-ON-TEES.

MAKERS, PATENTEES, AND ERECTORS IN ALL PARTS OF THE WORLD.

GASHOLDERS. (*a*) Large or small, with Wrought-Iron Standards, or Cast-Iron Columns.

(*b*) Guided by Pease's Wire Ropes. Ask Price and inspect those already at work. Full guarantee given.

(*c*) Cast or Wrought Iron Tanks.

Drawings and Designs for all sizes always in stock.

PURIFIERS. On the most modern system, with all kinds of Lifting Gear.

SCRUBBERS & WASHERS. Tower, with Canvas Screens.

New Mechanical Radial Washer-Scrubber, entirely new in principle, and supersedes all others.

CONDENSERS. Any capacity, Cast or Wrought, Tubular or Annular.

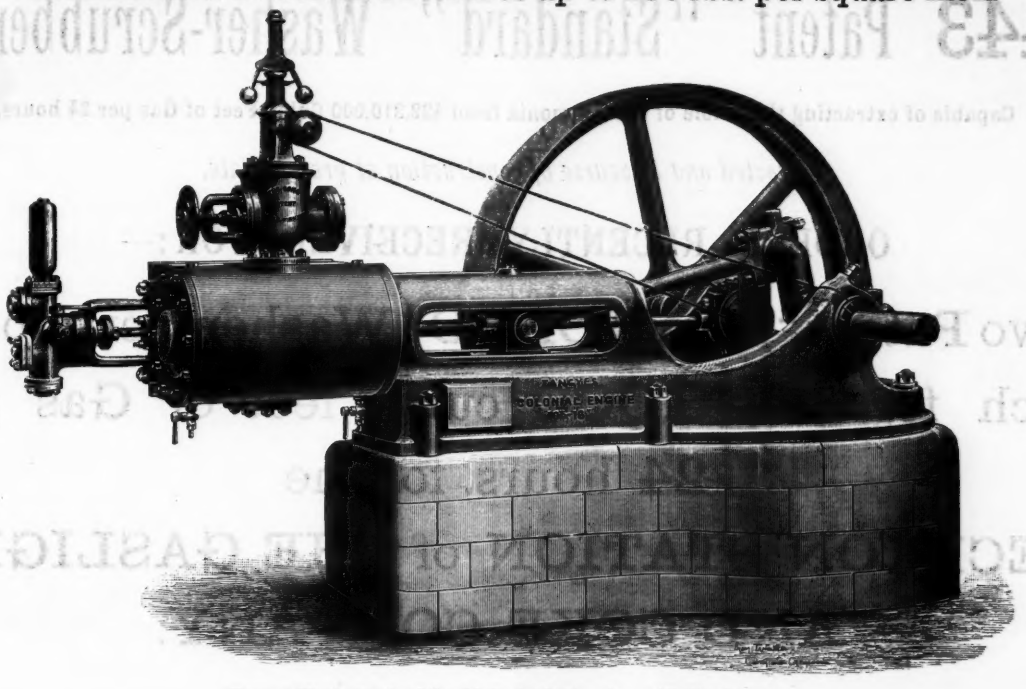
HYDRAULIC MAINS and RETORT-FITTINGS of every description.

RESIDUAL-RECOVERY PLANT. The most perfect Ammonia Still yet designed. New patent Saturator, entirely mechanical. Cyanide-recovery Plant.

TANGYES'

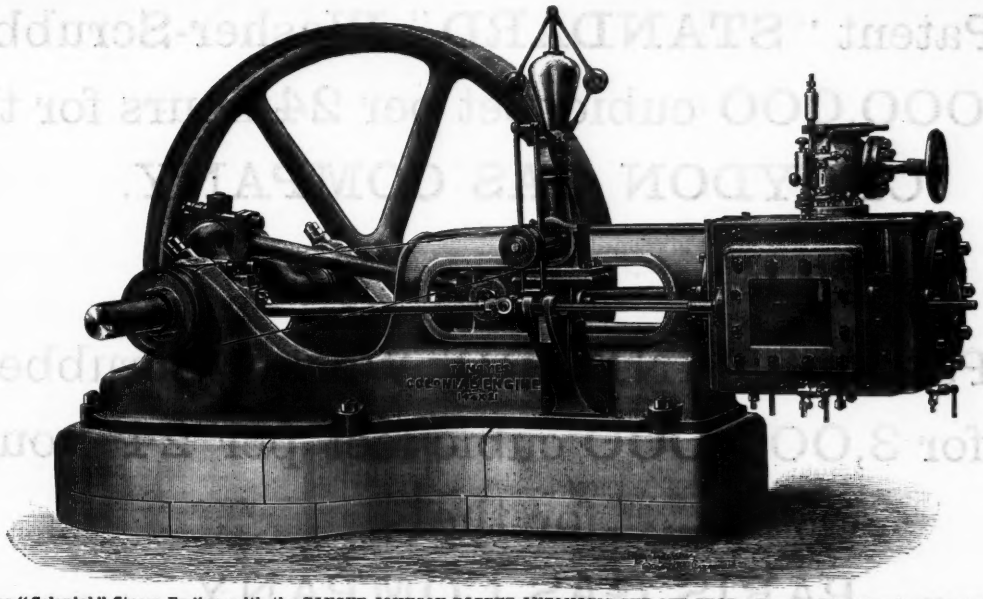
"COLONIAL" STEAM-ENGINE

Constructed for Steam Pressures up to 100 lbs. per square inch.



From a Photograph of the 10 in. by 16 in. size, with Feed Pump.

Steam Cylinder, diam. .. .. ins.	4½	5½	6½	7½	8	9	10	12	14½
Stroke, length .. .. .. "	7	8	9	9	12	14	16	18	21
Revolutions .. .. per min.	250	225	200	200	150	140	125	116	100



Tangyes "Colonial" Steam-Engine, with the TANGYE-JOHNSON PATENT AUTOMATIC CUT-OFF GEAR. From a Photograph of the 14½ in. by 21 in. size.

Steam Cylinder, diam. .. .. ins.	8	9	10	12	14½
Stroke, length .. .. "	12	14	16	18	21
Revolutions .. .. .. per min.	150	140	125	116	100

PRICES FOR ANY GIVEN SIZE QUOTED ON RECEIPT OF THE NECESSARY DATA.

TANGYES LIMITED, CORNWALL WORKS, BIRMINGHAM;

AND LONDON, NEWCASTLE, MANCHESTER, GLASGOW, SYDNEY, MELBOURNE, JOHANNESBURG, GENOA. BILBAO.

Telegrams: "TANGYES BIRMINGHAM." *Copyright. Entered at Stationers' Hall. No. 33 E.*

KIRKHAM, HULETT, & CHANDLER, LIMITED.

[SIDNEY HERSEY, Managing Director.] [J. CHANDLER, Engineer.]

443 Patent "Standard" Washer-Scrubbers,

Capable of extracting the whole of the Ammonia from 422,310,000 Cubic Feet of Gas per 24 hours,

Erected and in course of construction at present date.

ORDERS RECENTLY RECEIVED FOR:—

Two Patent "STANDARD" Washer-Scrubbers, each for 3,500,000 cubic feet of Gas per 24 hours, for the BECKTON STATION of THE GASLIGHT AND COKE COMPANY.

One Patent "STANDARD" Washer-Scrubber for 3,000,000 cubic feet per 24 hours for the CROYDON GAS COMPANY.

Two Patent "STANDARD" Washer-Scrubbers, each for 3,000,000 cubic feet per 24 hours, for the PARIS GAS COMPANY.

All New Patent "Standard" Washer-Scrubbers are fitted with the Company's Patent Improved Wooden "Bundles" or Washing devices, which can be readily fitted to old pattern Machines.

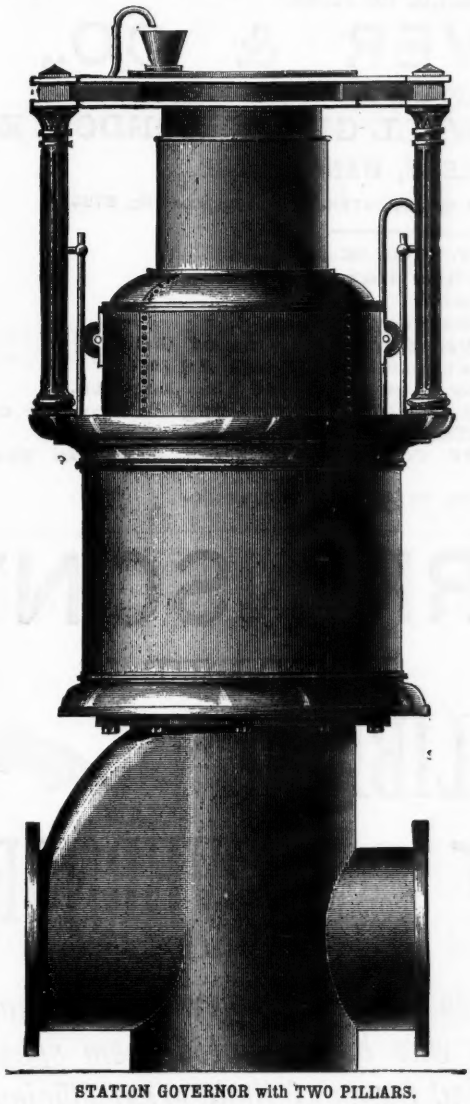
Address: 3 & 4, Palace Chambers, Bridge St., Westminster, London, S.W.

WM. COWAN'S PATENT GAS GOVERNOR.

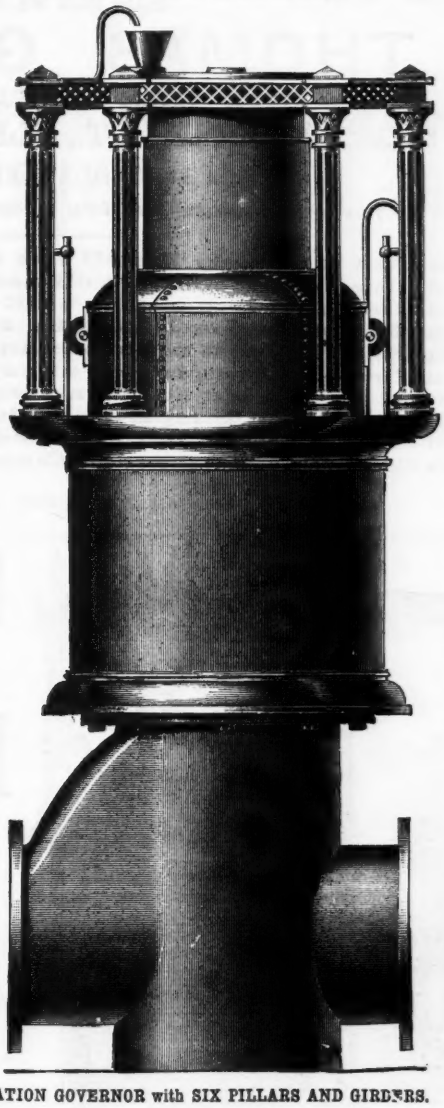
This Governor is a perfect regulator of gas pressure. Unaffected by **even the most extreme and sudden changes of inlet pressure or of draught,** it maintains, without variation, the pressure it is adjusted to give.

This result is attained by balancing the influence of the inlet pressure on the valve-base by an equivalent force, operating *above the roof of the bell.*

Another and a great advantage is the **unique water-loading arrangement,** which is made perfect and complete by the use of **WM. COWAN'S PATENT "STATIONARY SYPHON."**



STATION GOVERNOR with TWO PILLARS.



STATION GOVERNOR with SIX PILLARS AND GIRDERS.

The water loading is further utilized to maintain automatically the depth of the "seal" in the compensating slide. While the loading is going on, the water is first delivered into the slide, from which it overflows into the loading tank below.

We have supplied these Governors to many of the most important Gas-Works in the United Kingdom and abroad, to the Engineers of which we shall have pleasure in referring those who may favour us with inquiries.

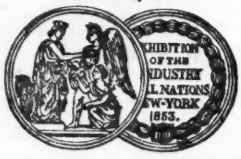
W. & B. COWAN,

ESTABLISHED 1827

SMITH SQUARE WORKS, WESTMINSTER,	DUTTON STREET, WORKS,	BUCCLEUCH STREET WORKS,
LONDON, S.W.	MANCHESTER.	EDINBURGH.
TELEPHONE No. 3250.	TELEPHONE No. 1545.	TELEPHONE No. 753.
"DISC LONDON."	TELEGRAPHIC ADDRESSES: "DISC MANCHESTER."	DISC EDINBURGH."

ESTABLISHED 1844.] **ORIGINAL MAKERS.** [ESTABLISHED 1844.]

London, 1851. New York, 1853. Paris, 1855. London, 1862.



Dublin, 1865. Paris, 1867.

The SIX MEDALS AWARDED to THOMAS GLOVER for

PATENT DRY GAS-METERS,

The latter being the Highest Medal awarded for Dry Gas-Meters by the Imperial Commissioners for the Universal Exhibition, Paris, 1867.
Since then we have not Exhibited for Prizes.

THOMAS GLOVER & CO.,

DRY GAS-METER MANUFACTURERS,

214 to 222, ST. JOHN ST., CLERKENWELL GREEN, LONDON, E.C.

And at 37, BLACKFRIARS STREET, MANCHESTER.

TELEGRAPHIC ADDRESSES: "GOTHIC LONDON," "GOTHIC MANCHESTER." TELEPHONE No. 6725.

1st—Are a remedy for all the defects of Wet Meters.
2nd—Are suitable for all climates, whether hot or cold.
3rd—Incur no loss of Gas by Evaporation.
4th—Cannot become fixed by Frost, however severe.
5th—Are the most accurate and unvarying measurers of Gas.
6th—Prevent jumping or unexpected extinction of the Lights.
7th—May be fixed either above or below the level of the Lights.
8th—Cannot be tampered with without visibly damaging the outer case.
9th—Will last much longer than Wet Meters.
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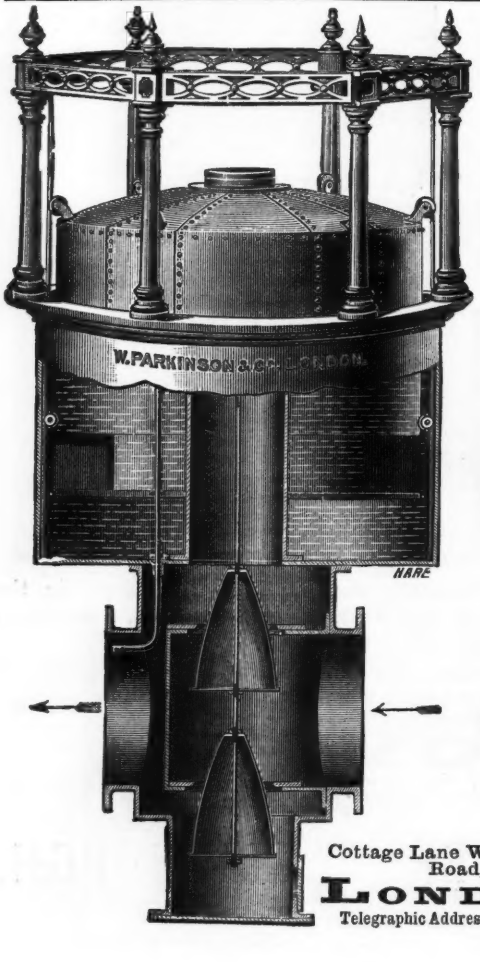

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[See also Advt. p., 468.

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THE
JOURNAL OF GAS LIGHTING,
WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, MARCH 8, 1892.

The Blunder of the Miners.

THE coal miners have not begun their threatened week's "play;" but, at the time of writing, the rashly-advised conspiracy between the coal-owners and the Unions has already had the worst effect predicted of it in our last week's issue. The idiotic schemers who control the miners' organizations, have succeeded in making the most stupendous blunder in the annals of Trade Unionism; and this is saying a great deal. The Social Democrats who have from time to time ordered "universal strikes" were foolish enough, in all conscience; but since their hare-brained orders were never obeyed, they did little real mischief. When the gas stokers were caused to throw up their livelihood for the sake of Trade Union principles, their leaders incurred a moral responsibility which few honest men who desire to sleep soundly at night would care to incur. But these mistakes shrink into insignificance, and their consequences, bad as these were, are completely dwarfed, beside the *fiasco* perpetrated by the Miners' Federation officials. For what do we see? Coal actually stacked in the dealers' yards has been forced up in selling value by 50 per cent. The unreflecting public have been alarmed for the continuance of coal supply, at a time, moreover, when all the worst rigours of winter have returned, and have demanded fuel at any price. The merchants and retailers have cleared out their stocks at exorbitant premiums, not one penny of which will ever reach the coal-owners, to say nothing of the miners. When the stocks were sold out, the merchants had to go to the pits for more; and, of course, they paid something in advance of the former rates—which makes the coal-owners' gain. Meanwhile, the miners have been getting up coal for the old rates of wages; and when their "play-time" comes, the owners will see them go out with all the resignation which ensues upon having the best of the bargain. By the time "play" is over, the season will be further advanced; the panic-stricken public will have stocked enough coal, at fancy prices, to last into the warmer days; and the pits will be required only to yield coal bought long ago at contract rates.

Well may *The Times* remark that "these magnificent "results of Federation strategy, aided by public panic, "are doubtless very satisfactory to coal-owners and to "dealers whose stocks have been sold off at a high "premium." But what about the lot of the working miner, for whose presumed benefit the whole scheme was conceived by his Union leaders; and how does he fare under the conditions artificially created in his name, which, whether or not they have enriched the owners and middlemen, have inflicted untold misery upon the struggling poor of the cities of greatest consumption? "It is they (the poor) who feel most severely the pinch "of dear coals in weather like the present. But they "feel even more acutely the loss of work inevitably en-"tailed upon them by the blowing-out of furnaces, the "stoppage of steel-works, alkali-works, and minor indus-"tries of a score of kinds. These working-class vagaries "indulged in usually at the bidding of some irresponsible "'executive,' fall with crushing severity upon the work-"ing classes themselves." Meanwhile, what have the Labour leaders—the Burnses, Manns, Tilletts, &c.—to say about the folly of the miners, which their dear dockers have to pay for? Well, most of them are discreetly silent, lest between the two stools of Miners' Unionism and Coal Consumers' Unionism they should come to the ground. Truly, those who have subscribed to the notion that a Trade Union can do no wrong are not to be envied in the circumstances. One Labour organ, however—the *Trade Unionist*—tells its readers that they had better have "cold hands and nipped noses," if the miners, in their wisdom, imagine they can take a week's play without dislocating the trade of the country. It is so easy to be hardy when one eats well and lies warm!

The cue has gone forth, however, that the big, foolish, unwieldy public are to be blamed for everything. Is anybody foolish enough to believe that the rise in coal prices "on the spot" benefits the dealers? He is wrong. Plenty of plausible gentlemen in the trade will convince him that the increased price which the consumer indubitably pays for his coal is of no real benefit to anybody. If the London public *will* pay 35s. for a ton of the "Wallsend" which they could have had a week before for 25s., it is quite fallacious to suppose that the dealer is gratified thereby! And as to the responsibility of the Unions in the matter, it is apparently considered sufficient by their spokesmen to disclaim all intention of creating a coal panic. Why will the stupid public play into the hands of the middleman? Why, indeed! It is ascribed by *The Times* to "the amiable peculiarity of the outsider, "from which the Stock Exchange reaps a golden harvest—"his mania for buying on a rising market." Be this as it may, the fact remains that the Trade Union muddlers have sown for others to reap, and have taught the world another expensive lesson upon the practical impossibility

of ensuring, in regard to human affairs, that actions shall have their intended effects.

Those of us who have wisdom enough to take heed lest, when we intend one thing, we do another, are perpetually caused to marvel at the rashness of modern Sciolists, who are ready to hazard everything on the efficiency of their own fancy remedies for all the ills of the body politic. Think of men like Mann and Tillett pretending to a certain knowledge of the way to abolish poverty—to have reduced the problem of humanity to a solution upon which a candidate for a parliamentary seat or a place in a County Council can base his appeal to a constituency! One is lost in admiration, in the old sense of the word, at such stupendous impudence, which would be impossible if it were not supported by fathomless ignorance. A wise man has said: "When I was a boy, I held many opinions, and "was quite sure of the validity of every one of them. "Now I am old, I have few convictions; and these I hold "with fear and trembling, lest, after all, I shall find my-"self deceived." We shall be told that this doubting spirit was not that of the old martyrs and leaders of enslaved men out of darkness into light and liberty, and that the man who waits to assure himself that he is entirely right about a debateable line of conduct, in his solicitude to make no mistakes renders himself incapable of making anything else. There is something in this, of course; but it is difficult to acquiesce in the comparison of a modern wire-puller to an ancient martyr, if only because, whereas the latter testified to the sincerity of his views at the cost of his own blood, and of all that man holds dear, the other, as a rule, takes particularly good care to "stand from "under" when he gets his supporters into trouble. When we see a self-appointed Labour leader manifestly worse for a strike that has ruined his dupes, we shall begin to believe in him. In regard to the threatened miners' strike, it presents the world with the peculiarity of having secured its own failure in advance; but the London coal merchants ought to pension off the Union leaders who have served them so handsomely, and who would have no power for further mischief if the Unions were really managed in the interest of the men.

The Condition of the National Gas Industry.

In the last few numbers of the Journal there have been given, according to custom, a variety of abstract reports of Gas Companies' working for the past year, which contain a mass of valuable information respecting the actual position of the gas industry of the United Kingdom. Speaking generally, these reports tell a tale of steadily growing business, with the peculiarity of dividends maintained by larger or smaller dips into accumulated profits. The statutory gas undertakings of the country may, indeed, be separated into the two grand classes of those which have earned their dividends and those which have not—the latter being in the majority. This is not by any means a circumstance to grieve over. It amounts, on the contrary, to an indisputable proof of the fact that modern Gas Companies are sailing very close to the wind in their efforts to balance their income and expenditure. It used to be said, by people who ought to have known better, that Gas Companies always made such enormous profits that the Directors hardly knew what to do to get rid of the money, and so avoid reductions in the price of gas. It was an amiable delusion of that easily-beguiled person, the writer of letters to the newspapers with a fondness for signing himself "A Constant "Reader," "Subscriber from the First," or some such pet name, that the one thing which directors had the greatest disinclination to do was to sell cheap gas. The experience of the last year or two must have taught this person, if he is teachable, that most gas directors have, in sober truth, the greatest disinclination to raise the price; and that sooner than take this abhorrent course, they will draw heavily upon the reserves which they and their predecessors put aside for a "rainy day." It should be obvious to critics of gas administration in town and country, moreover, that the process of draining reserves to avoid or to minimize increases of price must have its limitations. It is very false economy to weaken a gas company by exhausting the reserves, because the chances are great for the same company being perpetually in want of fresh capital wherewith to carry on its growing business; and this capital will always be most readily and cheaply raised by the undertakings which are financially strongest. It is therefore cheaper in the long run for the consumers to pay a little more when a passing pinch occurs, and so clear themselves, than to weaken the undertaking permanently or for any length of time.

The phenomena of a business which is continually growing, and yet does not always pay its way, is sufficiently curious to attract more than passing notice. It is quite possible, although it is not to be understood that we think it likely, that such derangements of the coal and labour markets as have ushered in the last decade of this nineteenth century may recur more rather than less frequently as the coal-fields grow old, and social politics grow more agitated through the spread of smattering book-learning among the poor. So long as the gas industry needs an open capital account, however, the opportunity will also be open for good management and administration to save money by prudent reconstructions of old undertakings upon new bases. The questions for every gas manager careful for his credit, and for every conscientious director, are: Where are we tending? What are we getting for our money? Ten years, twenty years, thirty years ago we stood *thus*. How do we stand to-day? Thanks to the perpetual ebb and flow of technical knowledge, it is possible for every engineer to determine with the greatest nicety what the new manufacturing, purifying, storeage, or distributing plant required for his expanding works ought to cost. The days ought to be over when a gasholder in one town could cost half as much again as one of the same capacity in the next district, merely on account of the different idiosyncrasies of the two designers. We ought to leave all this kind of uncertainty to our good friends the electricians.

It is, by the way, a significant circumstance that, so far as can be seen, the gas undertakings of the kingdom are not only growing fast, but are growing faster than the towns which they supply. Gas is not merely holding its own; but it is greatly improving its position. When, for example, we hear of any gas company increasing their output at the rate of 12 per cent. per annum, it does not mean that the district, but only that the undertaking, will be doubled in six years. How many gas undertakings have doubled their sale of gas during the last ten years? Why is it that no "light of the future" has been able to render this expansion unnecessary? The fact remains that Gas Companies everywhere have been left to "take up their own slack," until in many places they have become very tightly fitted indeed. Some timid gas directors—although we believe the charge applies more especially to members of corporation gas committees—have feared for years to spend money boldly and economically upon necessary extensions, and have condemned their engineers to eke out plant by all sorts of "skimping" expedients. This must be reconsidered. To disgust consumers with dirty gas and low pressures, is the surest way to convert imaginary competitors into real rivals. The evidence from all parts of the country which we have now collected ought to convince the most chicken-hearted of directors or of corporators that the crying need of the gas industry is not coddling, but more growing-room in its clothes.

The London County Council Election.

London provided itself with a fresh County Council last Saturday; and it is now known that the new body is composed in the main of so-called "Progressives." We only notice the election here because in the "program" issued in the name of the latter party, albeit disavowed by its more prominent members, the acquisition of the gas and water supplies figures very conspicuously. With regard to the imagined "municipalization" of the gas supply, as the term is, the folly of the "dreamers" of the old Council in aspiring to run the full length of the course permitted to old Corporations like Manchester and Birmingham, before they have learnt to walk even under the burdens inherited from the Metropolitan Board of Works, should hardly require serious denunciation. Yet it is a remarkable fact that, not content with bearing responsibilities still undischarged which have killed two Deputy-Chairmen and one Chief Engineer, there are people in and out of the County Council—probably more of the latter than the former—who prattle of taking over the gas undertakings as though it could be done with a turn of the hand. If a thing is only repeated loud and long enough, somebody will believe it in the end, however

absurd it may be; and therefore it is as well to notice the grounds upon which the acquisition of the gas supply is advocated as a right and easy thing for the County Council to take in hand—that is to say, when it has the time. It is all for the sake of plunder. The County Council gave up the coal dues, and now some of our "advanced" municipal politicians are hankering after the gas profits to help pay the rates. A correspondent writes to the *Pall Mall Gazette* to urge that if the London County Council were to do by the gas supply what "the seven "Municipalities of Manchester, Leeds, Nottingham, "Bradford, Leicester, Oldham, and Bolton" do, they might make a reduction of rates by as much as 14 per cent. Glorious prospect! To realize it, however, the Metropolitan gas undertakings would have to be bought up for 19 millions. It is admitted that "at present values" the property might be worth even 25 millions; "but," the ingenious valuer remarks, "it is unlikely that we would "pay more than 19 millions for our gas." That is to say, by hook or by crook, the Companies' property is to be depreciated in value by a fancy amount so as to suit the "Progressist" book, and everybody who has bought a gas share upon the faith of a statutory guarantee is to be robbed for the supposed benefit of the ratepayer. Progress, of course, is a Shibboleth of the day, as Mr. W. S. Lilly says, and it is popularly supposed to mean everything that is good and desirable. The truth still holds, however, that there are at least two parties to every bargain. In regard to transfers of gas undertakings, there are three —buyer, seller, and Parliament, which stands by to "see "fair;" and it is queer wisdom to assume that everything in a settlement of this nature is to be ordered in accordance with the views of one of the parties. He who reckons without his host was never looked upon as a prudent person; but it is apparently of such that some people think County Councils should be composed.

A Little Jest in the Lords.

THE House of Lords had their little joke again last week over Lord Stratheden and Campbell's Smoke Prevention Bill. The noble legislators seemed to enjoy themselves immensely while discussing, in serio-comic vein, the possibility of preventing the pollution of the air of London by the smoke from private chimneys. Mention was made, in the course of the debate, according to the newpaper reports, of a mysterious compound called "sulphite of ammonia," which was stated to be recoverable from coal smoke. Some noble lords waxed very scientific in their references to what might be done with this remarkable constituent of smoke. They even thought that it might pay the cost of carrying out Lord Stratheden and Campbell's ideas. The Prime Minister, however, rather dashed these growing hopes by confessing to an acquaintance with sulphite of ammonia, "which," he said, "has a vile odour more nearly resembling that of a drain "than anything else he knew." This statement from the head of the Government sadly perplexed noble lords, as indeed it does us. Of what was Lord Salisbury speaking? Sulphate of ammonia we all know; but supposing, as we have no right to do, that the noble Marquis pronounced the name of this useful chemical product like a Cockney costermonger, to whom the sounds of the first and third vowels in the English language are identical, where is the drain-like odour to be discovered? However, the subject has been referred to a Committee, to whom the truth about sulphate or sulphite of ammonia may perhaps be unfolded. The frequency and pungency with which the Premier has spoken on the subject of London smoke and fog has inspired *Punch* with the burlesque notion that the pending appeal to the country will be fought upon this issue—a (Hearth and) Home Rule question, in short. Unfortunately, there is but too good reason for believing that, while Administrations and Parliaments may come and go, smoke and fog will endure as long as any points of the British Constitution.

Mr. George Garnett, M. Inst. C.E., Engineer and Secretary of the Ryde Gas Company, has been again elected Chairman of the Ryde School Board. Mr. Garnett has not only earned the good opinion of his fellow-burgesses by the way in which he has discharged his public duties, but also their gratitude for many acts of benevolence. The latest example of his kindly consideration is the distribution, during the present sharp weather and the prevailing high price of coal, of tickets entitling the holder to 1 cwt. of coke at the gas-works. These tickets are given to the parents of the school children requiring assistance.

WATER AND SANITARY AFFAIRS.

THE second conference of the Metropolitan and Home County Members of Parliament, held at the beginning of last week under the auspices of Sir John Lubbock, in reference to the Birmingham Corporation Water Bill, resulted in no distinct resolution; but elicited an expression of "much regret" at the possibility of any further appropriation of water-bearing areas being agreed to by Parliament pending the report of the Royal Commission. The question is made to turn on the degree of urgency which attaches to the Birmingham scheme. The London County Council, by a resolution adopted on the day following this second conference, asks that Parliament will not pass the Birmingham Corporation Water Bill before the case for the Metropolis has been presented to the Royal Commission, unless it be shown that the need of Birmingham for an enlargement of its supply is so pressing as to admit of no delay. It is also understood that, should the Bill go forward, certain clauses will be introduced to prepare for a supply being furnished to the Metropolis from the same region as that to which Birmingham will have recourse. Thus the Royal Commission will be left out of the reckoning, if Birmingham is able to prove that its present supply is running short, and if the London County Council can keep its hold on the headwaters of the Wye. Yet the question may prove to have other issues connected with it. Wales has something to say about the matter, as well as Birmingham and London. Whether the Birmingham Corporation have devised a really good scheme is also open to doubt. As remarked by Sir John Lubbock, in his statement to the County Council last Tuesday, there is considerable opposition to the Bill in Birmingham itself. A curious question is also raised as to the rights of the commoners who are to be dislodged by the scheme—a point concerning which Mr. Shaw-Lefevre will have something to say in the House of Commons. But why should London trouble itself about the Birmingham Bill? There is no proof as yet that the Metropolis will have any need to go to Mid-Wales for a supply of water. This interference with Birmingham has an air of unreality about it, and looks like a piece of fussiness rather than anything else; except that it helps the County Council to look big, and suits the tactics by which it is sought to scare the Water Companies.

The water supply of London has been the subject of frequent reference both by speakers and writers, during the campaign of the candidates for the new County Council. On the one hand, the bait has been held out that, if the water supply were "municipalized," it would be very much cheaper; and, for some occult reasons, there would be no more fear of cholera or typhoid fever. Another view of the question shows that the real object of those who hold out this tempting prospect is to get an enormous amount of patronage into their hands, and to proceed to the "municipalization" of a mass of undertakings, such as would place the County Council in command of an industrial army of the most formidable and even dangerous proportions. Lord Rosebery, whose views are not generally deeemed extravagant, has been telling the electors in the City: "We have long dealt with land; "we are always dealing with land as one of the "necessities of the nation. We would deal with the air "if we could, as one of the necessities of life. It is water "alone which is sealed in this great Metropolis—sealed "to us largely by the action of Her Majesty's Govern-"ment." Here is assuredly a mistake. The "sealing" of the London Water Supply for the last eleven years is due to Sir William Harcourt and his allies, who threw over the Purchase Bill introduced by the present Lord Cross. What might be accomplished by means of a fair bargain is shown by a morning paper which may be looked upon as the organ of the County Council. In its columns we read that the water supply, yielding an average of 7 per cent. to the shareholders, would be made profitable, "even at the full market price," to a municipality borrowing at 2½ per cent. or less. To think otherwise, we are told, "is a fiction which imposes on no "man of business;" and Sir Henry James is rebuked for supposing that the purchase of the water supply by the County Council would be a burden to the ratepayers. It is a pity that the fiction was not exposed a little earlier. But still we find the notion entertained, as expressed in a communication to the *Pall Mall Gazette*, that London—

or rather the County Council—is by some means to get possession of the Metropolitan Water Supply for an amount far beneath the "market value." A new supply, it is said, can be obtained at a cost of 14 millions. But let the cost be what it may, supposing the supply to be in the hands of the County Council, financial success will mainly depend on good management; whereas if the policy of the past is to be pursued in the future, there is too much reason to apprehend that the water supply will be managed on other principles than those of a commercial character. A spirited reply to the *Pall Mall Gazette* contribution just mentioned appeared on the following day; showing that the scheme in hand was either to "wipe out the water undertakings without "any compensation, or compel the Companies to sell for "what is much less than half the market value of their "stock to-day." This is the real answer to Sir Henry James and Sir Richard Temple, who have ventured to show the "rash and hazardous" nature of the speculations into which the Progressive Party desire to plunge. The risk is to be diminished by the amount of the sacrifice to be enforced on other people—that is to say, on the unlucky possessors of the coveted property. The composition of the new County Council, on which there will apparently be three Progressives to one of the Moderate Party, also points to a sustained and vehement attack on the Water Companies.

The Gas-Meter Testing Staff of the London County Council.—At the meeting of the London County Council last Tuesday, the Public Control Committee reported respecting certain communications they had had before them from Mr. C. E. Mills, the Chief Inspector of Gas-Meters, and the inspectors at the several meter-testing stations, asking the Council to re-consider their positions and salaries. The result was, in the case of Mr. Mills, a recommendation of an increase of £20 per annum, as from the 1st of April next, with an annual increment to commence from September, 1893, instead of after ten years' service, and, in the case of the other inspectors, the raising of the salaries to the maximum of their class as from the 1st prox. The report was adopted.

Death of Sir J. Coode.—We regret to record the death, at the age of 76, of Sir John Coode, K.C.M.G., the eminent engineer. Sir John was President of the Institution of Civil Engineers in 1889 and 1890, and received, on behalf of the Institution, the large number of American engineers who visited Great Britain in a body during the summer of the former year. He was one of the Royal Commissioners for the Colonial and Indian Exhibition of 1886; and was President of the Engineering Section of the International Congress on Hygiene, which held its sittings in London in August last. He received his knighthood in 1872, on the completion of the Portland harbour and breakwater, on which he had been engaged since 1847; and he was made a K.C.M.G. in 1886.

Increases in Salaries in the Manchester Corporation Gas Department.—The Manchester City Council agreed last Wednesday to a recommendation of the Gas Committee that the salaries of several of the officials in their department should be increased as follows: Mr. C. Nickson, the Superintendent, from £500 to £600; Mr. W. C. Waddington, the Superintendent of Street Mains Department, from £350 to £400; Mr. F. A. Price, Principal Bookkeeper, from £250 to £300; Mr. T. Vosper, Chief Clerk, from £225 to £250; Mr. J. Whittingham, Principal Rental Clerk, from £170 to £180 per annum; Mr. G. Whittaker, Chief Meter Inspector, from £190 to £200 per annum; Mr. H. Lyon, Manager of the Gaythorn station, from £210 to £250 per annum; and Mr. E. Williams, Chemist, from £164 to £180.

Telephone Companies and Gas and Water Mains.—Mr. W. Livesey writes to call attention to the position of gas and water companies in regard to the powers now being sought by the National Telephone Company and the New Telephone Company, in the two Bills they are promoting. Of course, these Companies will have to be placed under uniform regulations, whereby gas and water mains will be duly protected; and already six petitions from gas, and four from water companies have been presented with the view of securing this protection. The time has now expired for lodging petitions; and altogether 112 have been deposited against the Bills, so that the opposition will be formidable. Mr. Kimber has given notice of his intention to move the rejection of the Bill of the first-named Company on its second reading; but should it pass that stage, Mr. R. G. Webster will move its reference to a Hybrid Committee, to whom are to be referred all petitions presented against the Bill three clear days before the Committee meet. If this motion is carried, it will enable all persons, whether they are interested or not, to appear if they think fit. Mr. Livesey points out that gas and water companies are, in these cases, masters of the situation, as there is no law, or ever likely to be, requiring a company to stop their supply in order to accommodate third parties who have no interest in the matter.

ESSAYS, COMMENTARIES, AND REVIEWS.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 456.)

THERE was some slight improvement to be discerned in some of the markets last week; but the general features were not changed. Progress towards that restoration of confidence which alone can produce a revival of business made scarcely any perceptible advance; and the resulting restriction in the volume of transactions followed. The coal scare also had a share in depressing rails. The demand for first-class securities, however, for investment kept well up, fostered by the further tendency of money to cheapen. The discount houses are giving only 1½ per cent. for money at call. In the Gas Market, there was a good deal more activity, especially in the issues of the Metropolitan Companies; but prices on the whole tended downwards. As the business of these Companies must have been improving lately, in point of sales of both gas and coke, the tendency to flatness was probably produced by a fear that the Companies might get pinched for coals in the course of the little game that is being played at the collieries. If so, we think the alarm is premature, and, in all probability, will not be justified in the end; but it is difficult to prophesy without knowing. Gaslight issues were active, especially "A." We noted last week some sign of a disposition to give way; and this quickly developed—a fall of 1½ on Monday being followed by another drop of 2 on Tuesday. The lowest point was reached on Wednesday, when 211¼ was marked twice. A vigorous struggle the next day concluded more in favour of the stock; the last mark being 214, and no further change supervened before the close. Less business was done in the debenture and preference issues; but prices kept steady, and the "H" 7 per cent. limited improved 1½. Transactions in South Metropolitans were more extensive than of late. The "B" was put down 1, but held on very firmly afterwards, and would not go any lower. A few transactions in Commercials presented no special features. The quotation of the old stock has at last been drawn in closer, working out 1½ higher; but prices marked remain about the same. Suburbans and Provincials continue steady, and very quiet. Dealings in the Continentals have also been considerably below the average; and the tendency was downwards. Imperial fell back 1; and Union, 3. All the rest of the Foreign division have been but little dealt in; and the only change was in San Paulo, which has dropped to par. The Water Companies are all weak; and nearly all have receded in quotation. The election has returned many of their enemies to the County Council; and they must again prepare to fight vigorously in defence of their rights.

The daily operations were: The Gas Market opened with an easier tendency, and prices generally were lower. Imperial Continental fell 1; San Paulo, ½; and Gaslight "A," 1½; but ditto "H" rose 1½. The tendency was the same on Tuesday—Gaslight "A" receding 2; and South Metropolitan "B," 1. In Water, New River debentures rose 1; but Lambeth fell 2. On Wednesday there was no change either way in Gas; but Water continued to fall. Kent receded 3; Chelsea, 2; Southwark, 1½; and East London, Grand Junction, and Lambeth, 1 each. Prices for Gas stocks on Thursday were mostly steady; but Continental Union relapsed 1½. Water remained unchanged. On Friday there were many transactions in Gaslight "A" with a favourable tendency. Commercial old rose 1½; but Continental Union receded to a similar extent. Chelsea Water fell 4. On Saturday nothing in Gas was touched but Gaslights, which were unchanged. Water quotations also were left standing.

ELECTRIC LIGHTING MEMORANDA.

Rivalry among Electricians—The Troubles of the City of London Company—Professor Forbes on Cheap Electricity.

IT is pretty to see, as Samuel Pepys would say, how touting electricians, like well-trained actors, can change their tone in accordance with the part they may happen to be playing at the moment. We are continually in receipt of newspaper cuttings, &c., from correspondents in various parts of the country, which display the versatility of well-known advertising electricians in adapting their propaganda to local tastes. It is rarely necessary to mention these communications here, because the statements which the electricians who cultivate the provincial trade prepare for consumption on the spot, are usually based upon previously published observations of men like Sir David Salomons, Mr. W. H. Preece, and other leading hands in the manufacture of plausible partizan arguments, which are generally dealt with in these columns at first hand. There is usually the best fun when rival tradesmen undertake to expose each other for the edification of a local authority known to be contemplating the carrying out of an Electric Lighting Order. Let a local agent of the Brush Company, for instance, fall foul of a House-to-House man, and then the home truths soon begin to fly about both parties! We will only cite one illustration of such proceedings; but many of our readers will recognize the circumstance as reflecting their own experience. Portsmouth is thinking of electrically lighting itself; and consequently the local press is full of disinterested communications

from representatives of different systems of electrical supply and distribution, all breathing intense anxiety lest the townspeople should be misled by designing persons. The arc men make heavy play with the aid of "French measurement;" until the incandescent partizans "expose the trick," and so the controversy rages amain. It is vastly edifying to receive these repeated assurances that it is necessary to extract the square root from the figures given in a certain class of electricians' estimates, in order to arrive at an approximation to the truth. But it is understood that the electrical profession has a sort of governing or representative body of its own, and we are moved to ask whether the respectable members of this organization cannot do something to stamp out this Anglo-American scandal, which is so constantly reappearing all over the land.

The City of London Electric Lighting Company are priming the newspapers with statements explanatory of the wonderful work they are doing in order to fulfil their engagements by something near the specified time. They declare that they are actually completing over a mile of trench-work every week; thus "beating the record" of similar work in any city, and, as they fondly imagine, placing themselves beyond the reach of hostile criticism. Coincident with the street work, it is claimed that great progress has been made with the generating stations. Buildings have been erected, and machinery is already running having a capacity of many thousands of lamps. In addition, it is pleaded that additional buildings, machinery, &c., are in hand, and that the Company's stations are "gradually developing into the largest and most complete in existence." All this means that the Company will not be in a position to fulfil their engagements with the City by the time specified; and they want that indulgence which the Commissioners of Sewers have already once refused. As we understand the case, the Company will have no other course than to throw themselves upon the mercy of the City authorities, and plead their own endeavours during the past year in extenuation of the just condemnation of the jobbery attendant upon their creation, for which they will seek to disclaim responsibility. We notice that the history of the floating of this Company by another, which did no work, but took a profit of £50,000 for placing contracts that had been going begging for years, is being used by a speculative concern having the Duke of Marlborough for its titular head as a bait for the investing public. This is the sort of thing which, in view of recent transactions that need not be more specifically mentioned, the City authorities are likely to take offence at just now; and it would only be in accordance with the wrong-headedness of public bodies in general if the Commissioners of Sewers were to wreak vengeance on the wrong parties.

Professor Forbes has completed his Cantor Lectures at the Society of Arts on the modern developments of electrical distribution; and these will be accepted, until superseded by yet later information from some source equally entitled to respect, as the best available information upon one of the most important points of electric lighting practice. The most remarkable feature of the concluding lecture was the author's treatment of the crucial question of the discrepancy between the average and the maximum power required for central lighting stations. Arguing from the example of Geneva, where water is first pumped from the Rhone by means of turbines to a reservoir some miles distant, and is then brought back through pipes to within a short distance of the intake, where it passes into the river again through turbines which drive the lighting dynamos, the lecturer said that there are places in this country where the conformation of the land favours a similar arrangement, only with steam pumping power for raising the water in the first instance. He put the case in this way; supposing a maximum of 1000-horse power to be required for lighting a certain town, then the average requirement would be represented by 150-horse power per hour. If now, instead of laying down steam plant to supply the maximum output direct, which would be needed for a short period of the day, and could only be produced very wastefully, a 150-horse power steam pumping-engine is kept in regular work—the most economical way of employing steam power known—the whole energy required could be stored up in a high-level reservoir at the lowest possible cost. Of course, it would need to be taken out again; but the loss by the turbines and the cost of the reservoirs, pipes, &c., would, in Professor Forbes's judgment, be much more than covered by the saving in the coal bill, in irregular attendance, &c., as compared with an ordinary steam station. It is a striking idea; and, according to the lecturer, there are hopes of its being tried in Edinburgh. It is quite possible that by this means the cost of the unit of electricity may be reduced in certain favoured localities; but it is not every town that enjoys the advantage of an elevated loch in the vicinity, that can be converted at small expense into a high-level storeage reservoir.

The Release of Hunter.—According to the Manchester papers, Samuel Hunter has been liberated, and is at present in the Metropolis, where, in all probability, he will in future reside. It will be remembered that the 18th inst. was the day named in the intimation received from the Home Office, as mentioned last week; but it is stated that the release took place on the 26th ult. The sentence was for five years; and of this term nearly four years were served—the first two being spent in Strangeways Gaol, and the rest of the time at Chatham and Portland.

THE CRYSTAL PALACE ELECTRICAL EXHIBITION.

Fifth Notice.

Great prominence is just now being given by the Crystal Palace management to the visits to the electrical exhibition of deputations from Municipalities, which are now becoming frequent. Whenever possible, these official visitors are announced some time in advance by placard and advertisement; so that the undistinguished public may elect between the possibility of sharing the atmosphere of the Palace with the august Corporation of Derby, the Local Board of Chowbent, or any other municipal magnates. Not all itinerant corporations, however, like to see themselves advertised in this way; but many—perhaps the majority—prefer to visit the Palace unannounced, and look through the exhibition like ordinary mortals. There is a certain advantage, of course, for local authorities who are interested in electric lighting in being able to see the exhibits of the leading firms of electrical engineers and contractors collected under one roof. They can thus form a shrewd opinion respecting the standing and style of the different competitors in this kind of trade—opinions, we may add, which are not always controlled by the mere bulk of the exhibit. For if an exhibition of this class serves no other useful purpose, it gives the rising men a chance of appealing to the impartial eye upon the merits or the price of their goods. In the electrical branch, as in other departments of the world of commerce and industry, it is by no means to be taken for granted that the biggest people are necessarily the most deserving of patronage. How is an astute trader to pay for his advertisements, if he cannot therewith persuade purchasers that it is to their advantage to give him half as much again for the same goods as other dealers supply?

Unfortunately, the one thing that municipal deputations cannot learn by visiting the present exhibition, is precisely the thing that generally concerns them most—we refer to the question of the system of generation and supply best suited to particular cases. Every system has the one object of "showing a light;" and there are plenty of lights shown at the Palace as the results of every known system. Here may be seen primary-battery lighting; lighting by direct driving from gas-engines and from steam-engines; lighting through storeage batteries of all sorts; lighting by low-voltage currents with two or three wires; lighting by high-voltage currents and transformers. All these and other systems are on view, from the generating plant to the lamps; and the partizans of every one are ready to offer any desired guarantees that their own methods are absolutely the best. How is a municipal deputation to decide upon this knotty question? It is at least certain that quite as much, if not more, information upon this subject can be gleaned from the quiet perusal of Professor George Forbes's Cantor Lectures, at the Society of Arts, as can be picked up in the course of a tour of inspection of the Crystal Palace exhibits. If a municipality are predisposed, through the counsel of their professional advisers, to pin their faith to Mr. Crompton, or to the Brush or the Woodhouse and Rawson Company, they will see nothing at the Palace to shake their good opinion of the work turned out by these firms. If, on the other hand, they have allowed themselves to be drawn in opposite ways by entertaining too many equally trustworthy, but divergent authorities, they will come away from the exhibition as perplexed as ever. For let us state once for all that, whereas in the Crystal Palace one system of electric lighting looks just as good as another, this is only because the result is obtained in every case by the rigid suppression of those economical considerations which are of paramount importance to those who are asked to put their money into central station electric lighting undertakings.

To return now to the exhibits of lamps and lighting. We notice that the enterprising firm of Messrs. Rashleigh Phipps and Dawson have been so eager to publish favourable press notices of their exhibits, the high and peculiar merit of which they point out with all the insistence of a showman at a fair, that they have reproduced in a little handbook of newspaper extracts one line from our article of the 16th ult. in which we are supposed to be commending "the high-toned work shown in this wonderful stall." A judicious neglect of context is the rule with abstractors of press notices; but the words quoted would strike any reader as having been wrenched from some sarcastically-written passage. Now, we by no means desire to deprive this pushing firm of the credit which is their due for a good deal of beautiful work in metal and glass, applied to the setting-forth of the incandescent electric lamp. There is much that is worth looking at in their stall in the Nave, and in the so-called Italian dining-room in the South-West Gallery, which has a set of light fittings to illustrate the solar system; the centre pendant over the table representing the sun, and the eight forged-iron wall-brackets symbolizing the principal planets. We respectfully decline, however, to take all those things at the valuation set upon them by the exhibitors, who need to cultivate more reserve in their treatment of this class of productions. When art-work is in question, interested invitations to admire it should surely be superfluous. Things really good will make their own way in time, without the help of puffery. For the present, the style of Messrs. Rashleigh Phipps and Dawson must be characterized as too exuberant. It needs

chastening, and the elimination of the *café orné* element; and then there will be little to find fault with.

For good honest fittings which, although occasionally reminiscent of gas and lamp fixtures, still preserve the domestic character, and do not suggest stagey effects, we are greatly disposed to commend the exhibits of Messrs. Faraday and Son, Messrs. Benham and Froud, Messrs. Evered and Co., Limited, Messrs. Sharp and Kent, Messrs. Shirley and Co., and Messrs. Barclay and Son. As a rule, the simpler fittings are the best. When the decorator attempts anything elaborate, he only too frequently goes astray through neglect or ignorance of first principles. He seldom remembers that the slavish imitation for novel applications of Louis Seize, Dutch seventeenth century, or so-called Queen Anne models, may serve chiefly to remind the spectator of the poverty of contemporary design; but he seems possessed with the erroneous notion that copying can take the place of creation. Will it be possible, we wonder, for the social historian of the twenty-fifth century to reconstruct a picture of a characteristic nineteenth century mansion of a good class, as we can, after a fashion, a Louis Quinze chateau?

This consideration leads up to a few remarks upon the furnished show-rooms in the galleries of the Palace, which repeat, upon an enlarged scale, the experiment first tried in 1882. Taking these upon the whole, the furniture and decoration are likely to strike the observer more than the lighting, which leaves a good many unsatisfied questions in the mind. The first suite of rooms to be entered from the Picture Gallery are lighted by Messrs. Rashleigh Phipps and Dawson. We enter them by a hall decorated in the Late Tudor style by Messrs. Godfrey Giles and Co., which is a really effective representation of a gloomy apartment such as our ancestors either deliberately loved or were compelled to put up with. There is no reason why we should do so; but "for those who like this sort of thing, this is just the sort of thing they like." Here, as elsewhere, the curious visitor may be recommended to count the lights, which just render the darkness visible. The adjoining dining-room, also by Messrs. Godfrey Giles and Co., apart from the lighting, is really very nice. It is decorated in smoked mahogany and deep blue, with a handsome panelled ceiling. The remarkable feature of these two rooms is that the whole decorative effect is produced by inexpensive means—Lincrusta Walton instead of carved wood and plaster mouldings, paper instead of tapestry, and removable parquetry. The result is to show that pretty room decorations are at last brought within the means of leaseholders. The dining-table here is a device of Dick Radclyffe, Limited, and Messrs. Rashleigh Phipps and Dawson. It has down the centre a water-tank in which little fountains play, edged with artificial arums, &c., containing small incandescent lamps. The effect is more tricky than comfortable. The drawing-room is strikingly decorated with bamboo by Mr. C. S. Walker, who does wonders with this unyielding material. The conservatory adjoining is by Dick Radclyffe, Limited, and is of the regulation exhibition pattern, with incandescent lamps shining from artificial palms, &c. In the middle is a perfectly hideous sham chandelier, with 15 glaringly false candles displaying incandescent filaments in all their nakedness.

Next we come to the so-called "Princess Christian" suite of furnished rooms, by Messrs. H. and J. Cooper, comprising a dining-room with old oak fittings and wall paintings let in; the table sumptuously, but not fantastically laid, and well lit by a shaded lamp. Here also the sham candles spoil the effect; but, with this reservation, the application of electric lighting in this suite is as good as anything in the Palace. The bed-room is very pretty, in the French style, with painted ceiling and lunettes; the hangings of the bed and windows being of old rose-silk and lace. Most of the lighting fittings here are by Faraday; and they do this firm great credit. The lights are sensibly disposed with regard to the dressing-table and the bed, which is not always the case. And here let us admit that the most satisfactory use of the special quality of the incandescent electric lamp to be seen at this exhibition is in some of these show bed-rooms, where a light is fixed inside the head of the bed, under the control of the occupant. In cases of sickness, or where the occupant desires to read or work in bed, the safety of the incandescent electric lamp gives it pre-eminence over every other known means of artificial lighting; but it is equally true that, with this exception, the incandescent lighting at the Palace shows no valid new departure whatever from the established uses of gas, oil, or candles.

Messrs. Allen and Mannooch have a pretty suite of rooms in the South Gallery, furnished regardless of expense, and without too much respect to fitness. By the way, it would be a good thing if the decorators and the sanitarians would take counsel together, and tell us whether or not we should hang our living and sleeping rooms with tapestry, chintz, ceiling stuffs, &c. It is easy to understand that parquetry flooring must be good for both reasons; but there is evidently room for discussion on the subject of wall and ceiling hangings. Scarlet fever does sometimes invade the abodes of the rich, who can afford to patronize West-end decorators; but it is hard to imagine one of these elegant apartments turned into a sick-room. Of the show made by Messrs. Frank Giles and Co., we have spoken in a previous article. It is very big, and expensively furnished with real and sham antiques; but the scheme of lighting is atrocious, and the general effect is more peculiar than inviting.

Messrs. Wallace and Co. have furnished a suite of rooms in an eminently pleasing and "come-at-able" style, which are lit by Messrs. Crompton and Co.; the fittings being the productions of Messrs. Taylor and Tucker. We also like the work of Messrs. Poole and Messrs. T. and W. Aldridge; the rooms being well lit directly from a gas-engine situated in the Machinery Annexe. Favourable mention is also due to Messrs. J. and S. Bowyer, for a very pretty suite of rooms. It cannot be denied that all these decorators and upholsterers have afforded every opportunity for the incandescent electric lamp to distinguish itself. They use it in all sizes and patterns—from the 50-candle lamp over the dining-room table, to the sham candle-flame lamp. It is shown in rooms panelled with black oak, and in boudoirs finished in shining white paint. It is used naked, and also heavily shaded. It is stuck up in the ceiling upon plaster bosses. It is brought down to the writing-table in the form of portable lamps. Everywhere the same observation may be made upon it—there are more lamps required to do the work than would be needed in the case of gas or oil, and they are pushed to a greater brilliancy than is usual in private lighting. The statistics as to the cost of current and cost of lamp renewals for these exhibition rooms will never be published; but the consideration is one that can hardly be overlooked by those who visit the display, not merely to be amused, but also for the purpose of learning lessons for application elsewhere.

The Management of the Rotherham Gas and Water Works.—The Rotherham Town Council, at their meeting on Wednesday, confirmed the appointment, mentioned last week, of Mr. Charles B. Newton as their Gas and Water Engineer. Mr. Newton is at present Superintendent of the Effingham Street station of the Sheffield Gas Company.

Institution of Civil Engineers.—At the meeting of this Institution last Tuesday, Dr. Werner von Siemens, of Berlin, was elected an honorary member, and the following as associate members: Mr. G. W. Anderson, Manager of the Upper Warlingham (Surrey) Gas-Works; Mr. J. R. Crook, Stud. Inst. C.E., of the Water and Drainage Department, Hong Kong; and Mr. J. F. Simmance, London representative of Messrs. Richmond and Co., Limited.

Mr. Bertram Ellis (son of Mr. H. D. Ellis, Secretary of the Commercial Gas Company) has been appointed by the Directors of the Oriental Gas Company Assistant-Engineer and Manager of the Company. Mr. Ellis was a pupil of Mr. Frank Livesey; and, among other work, he superintended, on behalf of the South Barracas Gas Company, the erection of their works in Buenos Ayres, which were completed last year. Mr. Ellis sailed for Calcutta in the P. and O. steamer *Chusan* last Friday.

Eastern Counties Gas Managers' Association.—The seventh general meeting of this Association will be held to-morrow week, in the Town Hall, Sleaford (which has been courteously placed at the disposal of the Association by the County Council), under the presidency of Mr. C. E. Jones, Assoc. M. Inst. C.E., of Chesterfield. According to the programme of arrangements issued by the Honorary Secretary and Treasurer (Mr. H. Wimhurst), the members will assemble at the gas-works shortly after noon, and after having partaken of refreshment, will proceed to the Town Hall, where the business will commence at half-past one. It will consist of the election of Mr. G. F. Cutting, of Downham Market, Mr. J. A. Fielding, of Waterbeach, and Mr. F. Kent, of Worksop, as members; the delivery by the President of his Inaugural Address; and the reading of a paper on "Consumers' Fittings," by Mr. J. H. Troughton, of Newmarket. The place for holding the autumn meeting will then be fixed; and the proceedings will close. The members will afterwards dine together at the Bristol Arms Hotel; and, for the convenience of members desirous of returning home the same day, the Great Eastern Railway Company have (on the suggestion of Mr. Wimhurst) consented to allow the 5.46 express from Lincoln to call at Sleaford about 6.10 p.m.

Waller's Patent Combined Exhauster and Gas-Engine on One Base-Plate.—Actuated partly by the discussion which took place in our columns some months ago, on the subject of working exhausters by means of gas-engines, Messrs. G. Waller and Co., of Park Street, Southwark, have been led to design a combined engine and exhauster on one base-plate, which is specially suitable in works where space is limited, as it can be fixed either on the ground or on an upper floor. It comprises disc-valves for the exhauster, an automatic bye-pass valve, and a throttle or relief valve, with regulator or governor; and the entire machine—say, one for a 500 cubic feet per hour exhauster and a 1-horse power gas-engine—occupies a space of only 6 ft. by 4 ft. 6 in., and 6 ft. high. With the exception of the fly-wheel and governor or regulator, the machine can be sent away in a case; and it only requires to be connected to the gas inlet and outlet mains to be ready for action. No skilled labour is needed, beyond what is necessary for connecting the gas and water supplies to the engine. With this machine, belts, countershafting, and fixing bye-pass, governor, valves, &c., in or above ground are obviated; and, though compact, every part is readily accessible. The engine is specially made with the crank below, which not only suits the arrangement better, but ensures steadier running. One of these machines has already been made for a colliery in Durham; and another for a Government gas-works.

NOTES.

A Smoke Recorder.

At a recent meeting of the Manchester Section of the Society of Chemical Industry, Mr. W. Thomson described an ingenious instrument, designed by himself, for automatically recording the density of smoke passing in chimney flues. In a number of experiments, Mr. Thomson found that by exposing pieces of paper in smoky chimneys, and withdrawing them after a few seconds, he obtained dark marks corresponding in depth with the amount of smoke passing up. He also ascertained that it is essential, in order that the paper should be properly marked, that it should be kept cold. His apparatus therefore consists of an arrangement whereby a strip of paper is exposed for a definite time in the interior of a chimney, being changed by clockwork after a period of exposure, while it is kept cool all the time by water circulating through the tube on which it is wound. The experimental apparatus pulls about 4 inches of the paper strip past the registering orifice during each hour. This orifice is merely a slit in a tube through which the smoke gases may impinge upon the paper within. Comparative diagrams of the actual performance of a chimney at different times are obtainable in this way; and some specimens of them were exhibited by Mr. Thomson to the meeting.

Advances in Pyrometry.

The progress of pyrometry is to be noticed in connection with Professor Roberts-Austen's recent Royal Institution lecture upon metals at high temperatures. In fusing iridium by the electric arc, in which the highest temperature yet measured by any instrument—2000° C.—was reached, the thermo-couple employed in the Le Chatelier pyrometer consisted of a rod of iridium and a rod of an alloy of the same metal with 10 per cent. of platinum. It is worthy of remark that within a few weeks the Royal Institution lecturers have publicly measured temperatures so widely separated as—200° and +2000° C.—a triumph of precision which would have been impossible a few years ago. Even before the introduction of M. Le Chatelier's instrument, as Professor Roberts-Austen admitted, a very considerable advance in pyrometry was made by Mr. Callender with his improvement of the Siemens apparatus, in which the alteration of the resistance of a platinum coil as the temperature rises, is used to measure the temperature. In this way temperatures up to 1500° C. can be determined with an error of not more than 0·1°. For the measurement of temperatures below that of melting iridium, M. Le Chatelier uses a thermo-couple consisting of two wires—one of platinum, and the other of an alloy of this metal with 10 per cent. of rhodium—simply twisted together. For the purpose of his lecture, Professor Roberts-Austen connected the ends of these wires in a circuit with a suitable reflecting galvanometer, which threw a spot of light upon a large scale fixed to the wall of the room. By means of this instrument, the lecturer was enabled to exhibit before a large audience the phenomenon of the recalescence of iron.

Sulpho-Cyanides in Gas-Works Residuals.

Some instructive remarks bearing upon the proposal to treat gas-works residuals for the recovery of cyanides were appended to a paper on the production of cyanides read by Mr. D. J. Playfair before the Glasgow and Scottish Section of the Society of Chemical Industry. After discussing the decomposition of sulpho-cyanides by the agency of various reducing media, the author stated that the sulpho-cyanides may be manufactured directly, or may be obtained as bye-products in gas manufacture. Dr. Lunge states the amount of sulpho-cyanide of ammonia in English gas liquors at about 25 lbs. per 100 gallons. Mr. Playfair declares that in no gas liquor of which he has been able to procure samples has the quantity reached anything like this figure. In Scotch gas liquor, after it has been treated for the extraction of ammonia, he has only found about 1 lb. of sulpho-cyanide of lime per 100 gallons. The refuse lime from gas purifiers contains sulpho-cyanides in larger proportion; but even this gas lime, from Scotch gas-works, contains less than 20 lbs. of sulpho-cyanide per ton. Moreover, in gas lime there is a large amount of hyposulphite of lime, which would require to be entirely removed from the sulpho-cyanide, as the presence of oxygen compounds is prejudicial to the formation of cyanides from sulpho-cyanides. The small quantities, as above mentioned, occurring in gas residuals are not, in Mr. Playfair's opinion, worth the cost of recovering; so it is preferable to make the sulpho-cyanides by direct processes.

A Smoke-Sewerage System.

It is sometimes urged, in connection with the smoke abatement movement, that black fogs will never be abolished in London and other congested centres of a bituminous coal-burning population until all smoke-flues, instead of discharging into the open air, are exhausted into trunk mains collecting the smoke in the same way and for the same collective treatment as is now applied to sewage. As a contribution to the facts of the question, mention may be made here of the experiments actually in progress on the Metropolitan Railway, at Neasden, with Mr. C. Anderson's system of exhausting smoke from railway tunnels. The freeing of the air of a tunnel from smoke produced by locomotives is a very different thing from collecting the smoke of a whole town; but there is still so much connection between the two problems that the successful solution of the one can hardly fail to throw light upon the other. Mr. Anderson's plan consists in laying between the metals in tunnels a horizontal trunk, with which the smoke-boxes of passing locomotives are to be placed in temporary connection, so that the smoke of the latter may be drawn off for discharge at some distant point. The provision of the main and of the exhausting arrangements would seem to be easy enough; but the connection of the former with the locomotive running up to 40 miles an hour would appear to be very difficult. In reality, however, it is easily made through a "slipper," or sliding box on the main, into which the smoke gases are discharged, and which is made to open valves placed in succession on the upper side of the main. The arrangements are stated to be so perfect that the fires burn better when discharging into the main than when the locomotive is running in the ordinary way. The exhauster maintains a 2-inch vacuum; and the smoke is washed before being finally discharged into the air. Some complicated calculations had to be made before the dimensions of the various parts of the Anderson apparatus could be fixed.

Death of Mr. W. Hammond.—The death is announced of Mr. William Hammond, formerly Secretary of the Hampton Court Gas Company. He was in his 71st year.

The Late Mr. W. H. Michael.—The late Mr. W. H. Michael, Q.C., whose sudden death at Meran, in the Tyrol, on the 15th ult., was briefly recorded in the JOURNAL recently, was called to the Bar of the Middle Temple in 1864, was made a Queen's Counsel in 1878, and was elected a Bencher of his Inn in 1882. He was a member of the South Wales Circuit, and a Justice of the Peace for Glamorganshire. In addition to the important work on "The Law of Gas and Water Supply" already mentioned (by which, of course, he was best known to our readers), he collaborated in the production of the "Manual of Public Health," and was the author of "The Sanitary Acts." The deceased was for many years one of the leaders of the Parliamentary Bar.

Modern Gas-Engines.—This was the title of a lecture delivered at the last ordinary meeting of the Leeds Association of Engineers, by Mr. W. Morris, of Lincoln. Commencing with the discovery of coal gas, the lecturer rapidly traced the progress of the gas-engine from the earliest types, including that known as the Barber engine. He said the makers of it introduced compression of the explosive mixture before explosion, in 1838—*i.e.*, 38 years before Dr. Otto. The Lenoir gas-engine, patented in this country in 1842, was very fully explained and illustrated by diagrams. The Otto-Langen free-piston gas-engine was described; and results of several practical tests were given, with diagrams. The Otto gas-engine next came under notice; and it was copiously illustrated with full-sized drawings and diagrams. The Atkinson engine was also described, and spoken of as the most economical engine in the market as regards its gas consumption. The Robey gas-engine (Messrs. Richardson and Norris's patent) was next referred to, and illustrated by complete full-sized drawings and diagrams of a 9-horse power (nominal) Robey engine. An example of the smallest engine made of this type was also shown in motion. With regard to the gas-engine of the future, the lecturer said he looked for economy in a hot cylinder and a regenerator.

Improved Public Lighting in Paris.—Reference has already been made in the JOURNAL to the successive improvements which have been effected in the public lighting of Paris by the employment of new types of gas-burners. Some months ago a project came before the Municipal Council to substitute 188 recuperative burners for a similar number of high-power burners for the lighting of the Place and the Boulevard St. Michel. The initial expenses attending the alteration were estimated at 37,400 frs.; but as a superior light would be obtained, with a saving of upwards of 21,000 frs., it was decided to carry out the project. By the 14th of July, the majority of the burners were in use, and giving admirable results. Since then, more than 150 new burners have been set up; the Municipality being convinced of the economy of the recuperative system of gas lighting for the public thoroughfares. Our contemporary the *Journal des Usines à Gaz* recently issued a map of Paris, showing the location of the "Industrial" recuperative burners in different parts of the city; and in an article in the same number, some particulars were given as to the progress made by this system of lighting. The first trials were conducted in the years 1886 and 1887; and they extended over a period of three years—the Municipality being desirous of thoroughly satisfying themselves before adopting any one of the systems submitted to them. On the occasion of the International Exhibition in 1889, some new types of burners were brought into service; and the results having been in every way convincing, it was decided, as from 1890, to modify the public lighting by substituting for the "Quatre Septembre" burners, passing 50 cubic feet of gas per hour, recuperative burners consuming exactly half as much gas, and giving a greater amount of light. "Industrial" burners, by which this economy is effected, have been installed in the Place des Victoires, the Place de la Bastille, the Avenue de l'Opéra, and the Rue du Quatre Septembre—the latter being the street in which the earliest efforts at improved public lighting were made in Paris; and there are now upwards of 800 of these burners in use in different parts of the city.

COMMUNICATED ARTICLES.

LIGHTING.

By W. H. Y. Webber.

Part IV.—The Photometry of Lighting.

(*Concluded from p.* 390.)

Mr. Ralph Richards, whose *Electrical Review* articles upon photometrical subjects have been several times referred to in this investigation of the matter, has made an ingenious attempt to reduce to exact arithmetrical expression the element of *perception* which enters so largely into all practical considerations of lighting effect. He calls this measurement of visual perception by the name of "optometry," and defines it as the experimental determination of the facility with which individuals are able to see the details of objects while the rays from a brilliant light-source are exercising a disturbing influence upon their eyes.

He starts with a brief discussion of what is meant by the term "brilliant" as applied to light; observing that gas light, electric light, and sun light are all popularly described as brilliant, while it is evident that the word cannot mean the same thing in all three instances. He proceeds to draw a distinction between brilliancy and luminosity, as exemplified in the ordinary conversational expressions, "a brilliantly-lighted room," and "a brilliant star." It is then pointed out that a room is not necessarily brilliantly illuminated by a brilliant light; for it is plain that while, speaking optically, a light-source is just as brilliant to look at from a distance of 100 yards as it is from one of 10 yards, its useful effect in lighting will be very different in the two cases. Now both Mr. Richards and Mr. Varley have shown (see also Professor Tait, in Vol. LVIII., p. 710) that the law of lighting bears a remarkable resemblance to the electrical law W = E C. This becomes apparent if W is taken to represent the effective illumination; E, the brilliancy, or surface radiation per square centimetre; and C, the area of the light-source in square centimetres. Whence it appears that the efficiency of any luminous source depends upon two factors, and not on one alone. In order to render these considerations more intelligible, and also to clear up any doubt respecting the meanings of the terms employed in connection with them, Mr. Richards has essayed to define with precision the words frequently employed so vaguely in regard to lighting and light-sources. Thus, he says, let the term—

Brilliancy, or intensity = the luminous radiation per square centimetre of the surface of a luminous body.

Luminosity = the total luminous radiation of a light-source.

Softness = a property of luminous bodies when the brilliancy is sufficiently small to cause but slight contraction of the pupil, and consequently to enable bodies to be seen more perfectly when the eye encounters at the same time the direct rays from the illuminant.

Diffusive power = a term practically implying the same as the preceding word, but which is thoroughly unscientific, because light-rays of all intensities travel at equal velocities for the same colour.

Luminous power = a term implying the same as luminosity.

Mr. Richards hopes that these definitions may help to extricate the terminology of photometry from the peculiarly illusive condition into which it has been brought by vague speakers and writers.

The problem in lighting is to secure the greatest possible amount of dispersion of light from the source employed, by the use of devices suitable for this purpose. Unfortunately, Mr. Richards admits, this is a difficult matter, because of the existence of a popular idea that a room must be poorly illuminated if the brilliance of the light-source is not great. If the necessities of lighting were the only things to be regarded, the best illumination a room could have, according to this author, would be obtained by making the ceiling a huge parabolic mirror, in the focus of which a light-source could be placed. Although this idea cannot be realized in practice, a little consideration of it will convince the student that, so far from a light-source of theoretical efficiency needing to be as brilliant as possible, in reality it is desirable that the contrary should be the case, provided that the light is confined to the required area.

It follows, from this way of stating the question, that theoretically the final emissive source—meaning the surface of the reflector or globe required to diffuse the light of an unbearably brilliant point—should be of infinite extent; but this, of course, is impossible. Since dispersive agents of limited size must be employed in practical lighting, it becomes important to ascertain the best sizes of these appliances for different purposes. For this end Mr. Richards has been led to devise an instrument which he proposes to call an "optometer." This apparatus, a diagrammatic sketch of which is here given (fig. 10), is intended to measure the final efficiency of a light-source, or, rather, to be used in conjunction with the photometer in arriving at the final result. The author remarks that "it is one thing to have a naked arc giving 1200-candle power, but quite another for this high efficiency to be utilized in a manner proportional to its great luminosity." This is the problem of all lights of intense brilliancy and high concentration. Mr. Richards's optometer consists of a tube J, preferably furnished with the object-glass and eye-piece of a telescope, to which are added a pair of smoked-glass wedges *Z* F, which can be adjusted so as to cut off any desired quantity of the light passing through them. The arc light or other luminous source under examination is removed to a distance of about 10 feet. A screen C D is interposed between the observer and the light, which passes through a small perforation at its centre. A mirror B is so disposed that, while it is out of the field of view of the telescope, it reflects a fair amount of light upon the screen C D, the surface of which

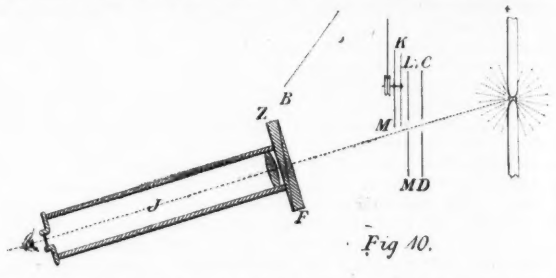


Fig 10.

bears several dull black painted lines, about ¼ inch wide. All being thus arranged, an observation is taken, by means of the telescope, of the light-source as it appears through the hole in the screen. A diaphragm of blackened card L M is now interposed between the screen and the telescope, having in it a hole so shaped that only a piece of the screen, of the form shown in fig. 11, is visible. A section disc K M is now placed before the screen, so that its outer circumference falls on the line L M, which coincides with the circumference of the aperture. "The portion L M, P M, of the screen C D is then blacked out; leaving merely the aperture and the portion of the disc visible through the opening K G M L open to view. The sector disc is then rotated and adjusted until the painted lines upon the screen C D are no longer distinguishable, and the adjustment is noted. The disc is now reopened, and the aperture in the screen C D closed. It will be seen, when the disc is again rotated and the adjustment necessary to extinguish the black lines upon C D noted, that two data are at hand. The first gives the apparent luminosity when the light-source is visible; the second, when this is not the case. Means are therefore at hand whereby it is possible to judge the efficiency of a light-source in relation to its brilliancy; and thus it is possible to judge the relative efficiency of modified and unmodified light-sources."

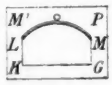


Fig 11.

Mr. Richards's language might be clearer; but his words must stand for themselves. He appears to be desirous of conveying the meaning that his suggested instrument supplies the possibility of determining, with reference to some fixed scale, the range of visibility of objects when the light by which they are perceived is itself visible and when it is obscured. This power of perception largely depends upon the condition of the iris, which varies in different circumstances and with different individuals. Writing from his own observation, Mr. Richards remarks that "the ability with which one is enabled to perceive the detail of surrounding objects, while the direct rays from the radiant are entering the eye, depends greatly—very greatly—on the brilliancy, but also on the luminosity; and it seems probable the latter has a great deal to do with the question."

In the practical investigation of this matter, a vast number of luminous sources of different kinds and intensities will come under observation. Mr. Richards has reduced some light-sources to a common standard, by observing them through smoked-glass wedges. He tabulates his results as follows; the term "brilliance," in the third column, being the quotient of the luminosity divided by the estimated radiating surface:—

Light-Source.	Candle Power.	Brilliance.
Union-jet gas-flame	10	0·2
Oil-lamp	12	0·5
Incandescent electric lamp	16	2·0
Arc lamp	1000	about 100·0
Magnesium tape burning 1 inch per second	150	50·0
Lime-light	300	50·0

Observation also shows that the pupil of the eye is dilated in proportion to the luminosity, supposing the brilliance to remain constant; but if the brilliance is increased, the luminosity remaining constant, then the iris will be contracted proportionately to this increase.

Here then, Mr. Richards remarks, we come face to face with a very important fact, the due consideration of which implies the whole knotty question of the final efficiency of all artificial light-sources. It has been emphasized that while the *total luminous radiation* cannot be too great in order to attain the best result, it is equally certain that the *brilliance* should be as low as possible, provided that the effect is confined to the area required to be illuminated.

This statement sums up the whole case against lighting by the electric arc. Mr. Richards wishes to remove the objections to this method of lighting by using a system of double parabolic reflectors for breaking up and diffusing the light of the arc, and at the same time for keeping it out of direct view. He regards the ordinary means of increasing the luminous surface in connection with arc lamps by the use of opal or wavy glass globes

as wasteful and generally unscientific. This may be so; but practical experience in lighting proves that the use of reflectors is much more objectionable unless they are made of a material so translucent as to permit of the passage of at least sufficient light to avoid the projection of a shadow, which is a consideration that does not seem to occur to Mr. Richards.

The truth of the matter is that lighting by arc lamps is rendered ineffective by the unmanageable brilliance of the sources. The opal globes have a very brilliant appearance at first sight; but the eye that takes them into its field of vision cannot well distinguish anything else. Mr. Richards admits this, and cites a trial which he made upon his own visual perception at the Hastings concert-room, when, notwithstanding the fact that the lighting was practically equal to that of daylight for reading purposes, "he found it perfectly impossible to distinguish the details of objects in its immediate vicinity, when looking at the arc at the same time." A similar observation has been made in regard to the electric arc lighting at the Crystal Palace. At the first glance, the impression produced by this example of the lighting of a large interior area is that of brilliancy in a high degree. The lamps here are of the Gülcher type, and their performance leaves nothing to be desired by way of steadiness. It is soon discovered, however, by promenaders under these lamps, that if one desires to see objects near the floor-level by their light—as the countenances of other people, articles exhibited, &c.—it is necessary to keep the eyes bent downwards, and to avoid, even at the cost of some inconvenience, direct vision of even distant lamps. Moreover, the effect of these brilliant lights upon the pupil of the eye is exhibited in the unpleasant phenomenon of the *visual impenetrability of the plane of the lamps*. This phenomenon may be otherwise described as the effect which renders it impossible for observers below the plane passing through the lamps, which is about 25 feet above the floor, to distinguish clearly any object above this plane; and it similarly prevents an observer in an elevated position above the lamps from seeing anything upon the floor. Thus the electric lamps make the vault above them appear as dim as though the lanterns were opaque at the top, which is not the case. It is possible to conclude from these observations that the electric arc will never be made a really good illuminant unless far more effective means for reducing its brilliancy and enlarging the radiant surface are introduced. Its unmanageable intensity is the great obstacle to the popularity of the electric arc light; and whosoever recommends its adoption, for either indoor or outdoor use, on the assumption that its illuminating efficiency, as practically tested by the human eye, is to be expressed in terms of its gross candle power, ignores the fundamental distinction between *light* and *lighting* which it has been the main purpose of these articles to emphasize and explain.

In conclusion, the reader's attention may be profitably directed to the description of a portable photometer devised by Mr. Carl Hering for measuring street lights and illumination in general, which is to be found in the paper read by him before the Engineers' Club of Philadelphia, and given in the JOURNAL for the 16th ult. (p. 293).

COAL GAS: ITS MANUFACTURE, DISTRIBUTION, AND CONSUMPTION.

A Series of Articles for Gas Students.

INTRODUCTORY.

The following series of papers have been prepared with a view to the assistance of intending candidates for the City and Guilds of London Institute Examinations in Gas Manufacture. They are addressed more especially to the younger students entering for the ordinary grade, than to those who, more advanced in the profession, and already grasping many of the details of successful gas management, have access to the various standard works, and other sources of information bearing on the subject, that are denied to many of their juniors. Such processes and inventions of recent introduction as bear upon the subjects under consideration, but are hardly beyond the sphere of experimental investigation, will therefore not be dealt with, further than by a mere passing reference.

The science of gas manufacture is eminently practical; and the student will truly find his best "works of reference," so to speak, in the works with which he may be connected. The preparation for an examination, the examination itself, and possibly the results of that examination, are but means to an end—*i.e.*, the complete mastery, in all its details, of the matter under study. Thanks to the management of the City and Guilds of London Institute, the papers set to the candidates are such as to induce to a practical preparation that shall be most helpful in the attainment of this end; and it is useless for the student to think that he will win honours at these examinations when fortified merely by study, however exhaustive, of the best books on the subject, to the exclusion of any *experience* of practical work.

This is as it should be. The student should make it his first business to master all the details of his own works. He should consult the every-day returns of his manager's report-book, and ascertain, as far as possible, the why and the wherefore of the constant variations in these returns. He should take every opportunity afforded, by the temporary shutting off of apparatus for repairs and by other means, of thoroughly investigating the construction and working of the various appliances in use, from the retort to the gasholder. He should also keep a sharp eye on general every-day working operations, and the various methods employed for duly carrying them on; and "when found make a note on't."

By such means, an intelligent and inquiring student may amass a stock of information that will eventually prove to him of much practical value. He is then in a position to consult, to the best advantage, the various authoritative writers in "King's Treatise on Coal Gas," and other standard works. Such information *must*, however, be supplemental to, and not substituted for, a practical acquaintance with every-day work.

COALS.

Of coals suitable for the production of illuminating gas, there are two chief kinds—cannel, found principally in Scotland as well as in Northumberland (Newcastle), North Wales, and Lancashire; and bituminous coal, found in numerous districts throughout the country. Many of the best coals of the latter class are raised in Northumberland and Durham, Lancashire and Yorkshire, North and South Wales. Lignite, or brown coal, and anthracite, are of no use to the gas maker, being practically destitute of the heavy hydrocarbons which are the light-giving properties of coal gas.

The approximate proportions of carbon, hydrogen, and oxygen present in these four classes of coal have been given as follows:—

	Carbon.	Hydrogen.	Oxygen.
(1) Lignite	396·01	15·00	25·93
(2) Caking coal	90·56	3·40	6·04
(3) Cannel	90·84	4·11	5·05
(4) Anthracite	80·89	1·13	17·98

(1) 100·00 (2) 100·00 (3) 100·00 (4) 100·00

Later analyses of good working samples of the second and third classes of coal, drawn from Lancashire pits, have given the following:—

	Coal.	Cannel.
Carbon	77·90	79·23
Hydrogen	5·32	6·08
Oxygen	9·53	7·24
Sulphur, ash, &c.	7·25	7·25
	100·00	100·00

Lignite is coal in its early stages of development. As the formation proceeds, carbonic acid (CO_2), moisture (H_2O), and carburetted hydrogen or marsh gas (CH_4), are, by the forces of Nature, gradually evolved; and the caking coal, the cannel, and finally the anthracite, are produced—the last-named having parted with nearly all its hydrogen and oxygen. Of bituminous coals, we have caking coal, just referred to, and so called because when heated it fuses into a pasty mass. It is a good gas coal; it does not require such high heats for distillation as cannel, nuts, or slack; and it produces a soft but good coke. Cherry, or soft coal, is similar to the foregoing; but it does not fuse in the retort. Splint, or hard coal, with few exceptions, is not used by gas makers. It is chiefly employed in smelting furnaces; and it yields a good hard coke.

Coal, like coal gas, has no definite chemical composition. Samples taken from the same district, and even from the same pit, will be found to vary considerably. This especially applies to pits of long standing, where old seams have been worked out, and new ones opened up. Then, again, dissimilar conditions of working produce varying results from coals drawn even from the same seam. What might well suit the methods of carbonization at one works would give very different results at another, owing to variations in the temperatures employed, and to other vital conditions. Laboratory tests, too, are exceedingly liable to error. The smallest error on a test of a few pounds becomes magnified many hundred times when calculated to the ton. For these reasons, while the laboratory analysis may give some idea of the capabilities of a particular coal, the best, and, to the writer's mind, the only means of ascertaining the commercial value of a coal to a certain gas undertaking is by making a practical test of it under conditions of every-day work.

Mr. Thomas Newbigging, in his "Gas Managers' Handbook," gives the average yield of Wigan cannel and coal and Newcastle coal as follows:—

	Wigan Cannel.	Wigan Coal.	Newcastle Coal.
Gas	10,900 c. ft.	9980 c. ft.	9700 c. ft.
Illuminating power	24 candles	15 candles	15 candles.
Coke	1436 lbs.	1517 lbs.	1540 lbs.
Tar	17 gals.	11 gals.	9 gals.
Ammoniacal liquor	18 „	20 „	10 „

Average Percentage Yield of Good Bituminous Coal.

Gas	18 per cent.
Coke and breeze	68 „
Tar	5 „
Ammoniacal liquor	9 „
	100

By dint of good management—every care being taken not only to prevent undue waste of crude gas, but to work on conditions best adapted for the particular class of coal in use—and also by arresting all traces of ammonia before the gas reaches the purifiers, some undertakings have secured the following yield per ton from good Newcastle coal:—

Gas (15 sperm candle)	9830 c. ft.
Coke	1500 lbs.
Tar	10 gals.
Ammoniacal liquor (5° Twaddel)	30 „

Many managers, however, are now constantly getting considerably higher results than the averages just quoted.

Cannel, rich in illuminating hydrocarbons, is almost universally used, in quantities varying from 2½ to 10 per cent. of the total bulk of coal carbonized, for raising the illuminating power of the gas in accordance with the requirements that may be imposed on various gas undertakings. For instance, the addition of (say) 5 per cent. of a cannel, yielding as per figures given above, to a coal giving (say) 10,000 cubic feet of 15-candle gas, would result in about 10,045 cubic feet of 15·48-candle gas per ton of the total quantity carbonized, or 10,000 cubic feet of 15·5-candle gas. The addition of 10 per cent. of cannel under similar conditions should give about 10,000 cubic feet of 16·1-candle gas.

The following rules bearing on the relation of quantity to quality of coal gas, are extracted, by permission, from Mr. Newbigging's "Handbook," and they may be helpful to the student:

To Find the Relation between Quantity of Gas per Ton and Illuminating Power. (*Farmer.*)

If a coal yields a known volume of gas of a known illuminating power, to ascertain how much it will yield of another value:

Rule.—Multiply yield of gas by illuminating power, divide by the *required* power, and the quotient is the quantity.

Example.—A coal yields 10,000 cubic feet per ton of 15-candle gas. How much will it yield of 14 and 16 candle gas respectively.

$$10{,}000 \times 15 = 150{,}000. \text{ Then}$$

$$\frac{150{,}000}{14} = 10{,}714 \text{ c. ft., and } \frac{150{,}000}{16} = 9375 \text{ c. ft.}$$

To Find the Value of Gas in Grains of Sperm per Cubic Foot from the Given Illuminating Power.

Rule.—Multiply 120 (the grains allowed per hour for the consumption of the standard sperm candle) by the illuminating power, and divide by 5 (consumption of gas in cubic feet per hour by the standard burner). The answer will be the value of the gas in grains of sperm per cubic foot.

To Find the Value of any Coal per Ton in Pounds of Sperm; the Yield of Gas and Illuminating Power being known.

Rule.—Multiply the cubic feet produced per ton by the value of the gas in grains of sperm per cubic foot (ascertained by the previous rule), and divide by 7000 (the number of grains in 1 lb. avoirdupois). The answer will be the value of the coal in pounds of sperm per ton.

The ash or mineral matter in gas coal varies considerably, both as regards quantity and composition. The following analysis of a good Newcastle coal is given in "King's Treatise on Coal Gas":—

Silica	59·56
Alumina	12·19
Peroxide of iron	15·96
Lime	9·99
Magnesia	1·13
Potash	1·17
	100·00

Brasses.—Some coals contain a considerable quantity of sulphur, chiefly in combination with iron as bisulphide of iron ($Fe S_2$), iron pyrites, readily detected by its brassy appearance on the fractured surface. Such a coal should be neither stored nor distilled in a wet condition. In the first case, it is much more liable to spontaneous combustion than if stored dry; in the second case, the steam produced in the retort, and there decomposed, tends to accelerate considerably the formation of sulphuretted hydrogen (HS_2) and carbon bisulphide (CS_2), and other compounds of sulphur, much of which might, had the coal been dry when placed in the retort, have remained in the coke.

The Retort-House.

Here it is that the dividends of a gas undertaking may be made or lost; hence the necessity for special care being exercised in this department. Having been selected and brought into the house, the coal has now to be subjected to a process of destructive distillation; all the volatile portions—gas, tar, ammonia, water, &c.—being expelled by heat, and every care taken to ensure that none escape. The solid residue—coke, ash, &c.—is periodically extracted from the still (the retort), and fresh coal put in its place.

In the successful extraction of these volatile constituents of the coal, it is necessary to ascertain certain conditions which may materially affect the results to be obtained. The chief of these conditions are the time allowed for the period of distillation, and the temperature at which the operation is to be carried on. Both conditions will depend, in part, upon the class of coal in use. Reckoning, in estimating the weight to constitute a charge (*i.e.*, one retort full of coal), for any swelling of the coal which may take place on heating, the usual plan is to allow six hours for the complete working off of all the volatile matter that will be of use to the gas maker. Some engineers prefer four-hour charges. The best gas—*i.e.*, that which is most rich in light-giving hydrocarbons—comes off during the third and fourth hours of the charge.

The matter of temperature is perhaps more difficult to decide. Some engineers prefer very high heats, with a resultant high yield of comparatively poor gas and little tar. Others go to the other extreme; obtaining a low yield of rich gas and much tar. But most gas makers strike a mean between the two, and prefer to work at a temperature varying from 1750° to 1900° Fahr.

The following temperatures are taken from a table prepared by M. Pouillet: Cherry red, 1650° Fahr.; bright red, 1830° Fahr.; orange, 2010° Fahr.; bright orange, 2190° Fahr.

(*To be continued.*)

TECHNICAL RECORD.

MANCHESTER DISTRICT INSTITUTION OF GAS ENGINEERS.

The Annual Meeting in Manchester.

We complete to-day our report, commenced last week, of the proceedings at the above meeting, by giving the following paper, prepared by Mr. T. Newbigging (which, in his absence, was read by the Secretary), with the discussion thereon:—

MANAGEMENT.

I do not care to be thought ambitious of playing the *rôle* of patriarch. I know very well that advice when it is cheap is often of but little value; and sometimes when it is unsought we are tempted to tell the giver to "save his breath to cool his broth." And yet "a word spoken in season how good it is!" The goodness of the advice is the test of its value. Advice may be bad as well as good; and discrimination is necessary before accepting it. The subject I have chosen to dilate upon is that of "Management"—the management of gas-works.

There is a great deal in managing workmen. Some managers can do this naturally; they have a genius for it. It comes to them by nature. With others, again, it is difficult. Their natural temperament is against them. They are perhaps too self-conscious, which is usually a defect, leading them readily, and on the slightest occasion, to take offence. Or they are liable to abstraction, which is another defect. It prevents a man from having his eyes open and taking a wide view. Such a one is an absent-minded man. He may possess more intellect, and be a deeper thinker, and have greater experience, than his more successful brother; but he lacks the knack or tact of the other. An objective turn of mind should be cultivated by a man who aspires to be a manager of men. That is the working mood. As a rule, perhaps, men are inclined to be subjective; and if this mood is strong upon them, they may be inventors or philosophers, but they will only be indifferent managers.

Whilst with some to manage men is a natural instinct, with others it is an art to be learnt. Happily, the art can be acquired; and, in a less or greater degree, every manager should study to acquire it. Indeed, it is indispensable to success in the position he holds. The ability to manage men, and the exercise of it, smoothes the thorny path of management. The wheels of the machinery run with less noise and friction; there are fewer "back-lashes" to endanger the cogs, and throw the pinions of life out of gear.

A judicious mixture of firmness, fairness, and urbanity is needful for success in managing men. To be fair whilst you are firm secures confidence in your judgment, and in your character for straightforwardness. One can be firm without bluster. Urbanity is not a sign of weakness, and it sugars the pill of command. Our greatest generals have been men of quiet demeanour—not given to superciliousness. The order to do a thing should be given with a due sense and knowledge or belief that the person ordered is able to perform the duty imposed upon him. An unreasoning and unreasonable order secures its own defeat; and it is more discreditable to the person in command than to the incompetent servant.

A bond of sympathy should unite the manager and his workmen; and it is the manager who must weave it. Sympathy may well flow downwards, like water; but it also rises as water does when the tide is coming in. When the waters meet, there is peace and a great stillness, and a full sense of satisfaction. Where there is indifference, the sympathetic waters recede, and there is a barren strand—or worse, for it is littered with a noxious growth that poisons the air.

In the management of men, a display of partiality and favouritism should be avoided. This does not imply that a good workman and a willing should not have the special recognition which his services deserve. To reward merit is not to show favouritism; it is simply to pay for value received.

A drunken workman is a pest and a nuisance to a manager. He may be handy and useful, and even a genius when sober. But he is never to be depended on; and the irritation and anxiety which his unsteady conduct induces, more than outweigh his good qualities. A sober man, if more commonplace and less competent, is infinitely to be preferred.

Get rid of a spy and a tale-bearer. Such a one is nearly always the bringer of bad news; and not unfrequently his story is false. A story can be false and fiendish, and yet founded on fact. There are often extenuating circumstances that alter the colour of a man's conduct, or an apparently bad action. A tale-bearer, in the recital of his story, takes no account of these, but rather keeps them in the background. The wound which he inflicts on his master is often greater than the ill he intends for his fellow-workman. Get rid of him. If notice of dismissal is required, pay him a week's or a fortnight's wages, and let him go—consoling yourself with the reflection that his absence is cheap at the price.

A gas manager has to manage the consumers as well as his workmen; and that is sometimes as difficult a task as, and frequently a more delicate task than, the other. To do this with success requires the play of another set of qualities. He stands in altogether a different relation to the consumers to what he does to his employers. The lever and fulcrum of command are out of place here. His straightforwardness of character is still to be manifest—that is a *sine quâ non* at all

times and under all circumstances. But an equable temper and a patient persistence are required. Prompt attention is expected of him; his persuasive powers have to be brought more into requisition; and a certain courtesy of demeanour has to be exercised even under aggravating conditions.

The first and chief duty of a gas manager, as such, is to aim at making the business under his charge a successful one. To that end, he will use all proper endeavours to conciliate and satisfy his customers. But he will at the same time be slow to listen to the whispers, or even the shrieks, of malignant tongues, who, without justification, and in the face of proof to the contrary, bring charges of extortion against the undertaking over which he exercises his care, and of the vileness of the commodity which he dispenses. The very success of gas enterprise makes it a mark for envy and detraction.

There is no better criterion of good management than a works kept in a state of neatness, orderliness, and method. To use a trite expression, there should be "a place for everything, and everything should be in its place"—not squandered and littered over the premises. Heavy stores, such as cast-iron pipes and castings in the storeage yard, should be arranged in order, according to their sizes. So with fittings of every kind in the covered stores. Old metal should have its corner assigned; and rubbish of all descriptions, if necessary to retain it, should be in a place apart. It is a mistake to choke a yard with coke. To store and hold coke is an expensive and generally unwise policy. Better clear it out at a low price than stack it like a mountain in expectation of a higher. The fact that you have a big stock defeats your object. Besides, when you sell it low, you get many people into the habit of using it. You manufacture customers; and in time there is such a wide-spread and steady demand as to justify a reasonable rise in price. How common is it to see the furnace ashes dumped out in a heap containing possibly 20 per cent. of good coke. This is a waste that should not be tolerated; and, generally, it would pay to have the coke hand-picked from the mass.

Keep your buildings—both walls, roofs, and woodwork—in a state of decent repair. A free use of paint over ironwork is economical, and a frequent coat of limewash to the inside of the walls brightens and sweetens a retort-house. In a word, take a pride in your works, and determine that, so far as the means at your command will admit, they shall be conspicuous both as to equipment and general results—remembering that disorder and dirt mean waste; and orderliness and cleanliness, economy.

But "I am hampered by my committee," says one. A committee is often what the manager wills. If he, by integrity and assiduity, proves his competency for his position, he will win the regard, the confidence, and the support of his committee, or the sensible majority of them; and an obstructionist member will in the long run have the ground cut from under his feet, and will either be turned into a friend or retire discomfited.

The manager of a small or moderate-sized gas-works has often spare time on his hands. I would advise such a man not to be gadding off on every opportunity, but to employ his precious leisure usefully in the study of practical chemistry or some other branch of physical science. In elucidating the processes of his own special work, there is yet much to be done. With all that has been said and written on the distillation of coal, the process is one about which we have a vast deal still to learn. I do not for one moment believe that we have attained to anything like perfection in that very first of the processes of gas manufacture. It is not without warrant that I say we are far from making the most of that wonderfully complex mineral—that most wonderful of all the minerals—coal. I fear we are not getting the quantity, and certainly we are not getting the illuminating value from it, that it is capable of yielding. I wish some of our young and active spirits would go into a retort when it is in action and the lid closed, and observe what is going on inside. I earnestly wish they would put their brains into it, that they would project the eye of their intelligence into it, and unravel to us the mysterious operations that are taking place there. That will be done some day by someone. If you feel that this is a task beyond your power, and that you must be content to labour on a lower plane, at least you can determine to do your "utmost best" according to your capacity; and in doing this, you will find unhappily that the way to truth is often through a certain amount of error. In the course of our investigations, it is not always possible to hit the mark at first; and we may at times be wrong both in our theory and practice. But if we pursue our studies, we shall get on to the right track in the end. It requires great courage to state one's views when they run counter to the current and orthodox and almost universal opinions that are held by high authorities; and to be heterodox in science or in art (no less than in theology) is to invite a certain amount of obloquy, and even persecution for a time. Nevertheless, to express one's views fearlessly, is to assist at arriving at the truth. If they are wrong, they can be confuted; and if right in the main, they will not want for consideration.

Finally, in the words put into the mouth of Polonius, I would say to every gas manager: "To thine own self be true, and it must follow, as the night the day, thou canst not then be false to any man."

Discussion.

Mr. C. E. Jones (Chesterfield) said this was the first time in his experience that gas managers had been recommended to commit suicide by carbonization However, they were very much obliged to Mr. Newbigging for an interesting paper; and he proposed that their heartiest thanks be given to him for it.

Mr. T. B. Ball (Rochdale) regretted that Mr. Newbigging was not present at the meeting There was nothing in the paper to which anyone could take exception; but he fancied he could see the smile which lurked about the corners of the author's mouth when he penned some of its phrases. It reminded him of the Book of Proverbs. Mr. Newbigging, whose experience dated some time back, took a too roseate view of the position of the gas manager to-day. He fancied most of those who were in actual charge of works would agree that the manager's position now was very different from what it was a few years ago. Certainly his (Mr. Ball's) experience was that the difficulty of conducting gas-works was considerably greater than when he first became acquainted with the duties; and this, he feared, was the experience of the majority of managers. Notwithstanding the concessions which had been made to the men, and the shortened hours of labour, the work was not so well done as it used to be; and one's relations with the men were not so cordial and so close as they formerly were. Perhaps this might be due as much to faults of temperament on his own part as to other causes; but he fancied this was not confined to his own works, and that others would have experienced the same thing. Indeed, he did not see how the relations of manager and men could be as of old, for they had now to deal with outsiders instead of with their own men. Mr. Newbigging also referred to the subject of storing coke, and held that this was an expensive and unwise policy. This statement should be taken with a reservation. To clear out the coke as produced would, in his opinion, not be wise, because in certain districts there was a demand for coke in summer time; and it was desirable that, if people acquired the habit of using it, gas managers ought to be able to supply it all the year round. It might be unwise to store more than would supply this demand; but a certain quantity was necessary. He had much pleasure in seconding the motion.

Mr. W. Severs (Lymm) said, in reference to the storeage of coke, he was asked a short time ago by one of his consumers to reserve about 30 or 40 tons. He did it, and then the customer said he had obtained it at a cheaper rate from Rochdale; and he (Mr. Severs) was consequently "left in the lurch." Afterwards he was glad the bargain was off, for the coke became thoroughly wet; and when he did sell it, it weighed so much heavier on account of its drenching.

Mr. Ball said the story did not apply to Rochdale, for, as a matter of fact, they never sold a ton of coke out of the town.

Mr. T. Duxbury (Darwen) remarked that there was not a great deal in the paper that could be criticized, as Mr. Ball rather suggested; but he (Mr. Duxbury) quite agreed that the difficulties of a manager's position were greater at the present day than when Mr. Newbigging occupied it. As a matter of fact, the workmen in their combinations looked upon the manager with great hostility; he was also regarded with hostility by the consumers; and even some of his own Committee were frequently against him. Under circumstances like these, it was very difficult for him to discharge his duties and keep a pleasant face. As to the storeage of coke, he (Mr. Duxbury) was situated like Mr. Severs, with the difference that he was close to another and competing gas-works. He had that day 5000 tons of coke in his works. In the neighbourhood of Darwen, coke was an article which was sold at a certain price in the town, and at a lower figure if taken outside. As a consequence, people bought coke at a neighbouring works, and came to Darwen to sell it. With reference to another remark by Mr. Newbigging, no doubt works should be, as far as possible, kept in good order; but this was not always an easy thing to do.

Mr. G. Smedley (Buxton) endorsed the remarks of previous speakers as to the members' indebtedness to Mr. Newbigging, who was perfectly correct in almost all the observations in his paper. He (Mr. Smedley) was sorry to hear his neighbours say that their relations with their consumers and their workmen were not what they used to be. He was in the happy position of being right with both. He did not know that, in the whole of his experience, he was in a better position with his men. This, he believed, arose from the fact that he had in operation the principle on which Mr. George Livesey had more recently acted, of having the men directly interested in all they did. The stokers were paid according to the production of gas. He had men who had been with him ten years; and only the previous day one said he had never spent a happier time than that which he had passed at the Buxton Gas-Works. All the men were doing their work willingly and well. As to coke, he agreed with Mr. Newbigging that it was better to get rid of it than to stack it at the risk of depreciating 25 per cent. Here again he was perhaps in a better position than most of his fellow-members, for it was his greatest difficulty to store enough coke in the winter to supply his customers in the spring.

Mr. J. Hutchinson (Barnsley) remarked that in his town they were quite cleared out of coke, in anticipation, no doubt, of the closing of the coal pits. The circumstance was unprecedented at the Barnsley works at this period of the year.

The motion was then put and carried.

Alderman J. R. Foord has been appointed a Director of the Brompton, Chatham, and Gillingham Water Company in succession to his late brother, Alderman W. Foord.

THE PARKINSON CONDENSED GAS COMPANY.

Under the above title, a Company has been formed in Manchester for the introduction of a new patented process for the extraction of oxygen from the atmosphere, and supplying it, compressed in steel cylinders, in a high state of purity, for commercial and other purposes, for the use of comparatively small consumers, and for the erection of complete plants on which a royalty would be charged, when large quantities are regularly required. With the view of demonstrating the process, and also of manufacturing the oxygen gas, a complete plant has just been erected at Stretford, near Manchester; and a representative has had an opportunity of inspecting the system employed, and the various appliances which have been put down.

Before describing the plant itself, it may be mentioned that, in conducting the experiments which have resulted in perfecting the present process, Mr. J. H. Parkinson, the inventor, aimed at finding, if possible, a substance which would be unaffected by moisture or carbonic acid, and which being in a highly porous state, would readily permit the air, when passed over it, to permeate the mass thoroughly, and come in contact with every possible portion of the chemicals. Hitherto baryta has been largely used for the preparation of oxygen. In connection with the employment of this material, however, several serious disadvantages sometimes arise, which Mr. Parkinson desired to avoid; and he found out that the conditions he aimed at were best satisfied by the use of permanganate of potash specially prepared. It is well known that, when quick-lime comes in contact with moisture, a great quantity of heat is generated, in consequence of the lime absorbing the moisture, and passing from the state of oxide to that of hydrate. So much heat is produced, in fact, that it has been known to cause organic substances to char, or even to take fire; and hence, when required to be conveyed in large quantities from place to place—whether in ships or by other means—special regulations have to be made so as to overcome the risk of fire. The oxide of baryta, as used for the production of oxygen, possesses the same characteristics as lime in this respect, though in a much greater degree; and in consequence of its avidity for moisture being so intense, the utmost precautions have to be taken, where it is the substance employed, to extract all possible moisture from the air previous to its passage over the baryta. The resulting effect, if this is not thoroughly done, has been that the lumps or fragments of baryta gradually unite or solder together into large masses of considerably less porosity than they originally possessed; and they are chemically spoiled in the same proportion as they have imbibed the moisture. Even when the greatest care has been exercised, this drawback is experienced more or less. By making permanganate of potash the agent employed to effect the separation of the oxygen from the atmosphere, it has been found entirely unnecessary to take any precautions to dry the air before passing it over the chemicals, as the moisture in no way deteriorates them. As it is of the greatest importance that the active reagent should be in as porous a condition as possible, Mr. Parkinson found, as the outcome of numerous experiments, that an excellent result could be obtained by intimately incorporating the very finely-powdered permanganate of potash with from 12 to 15 per cent. of its weight of a good quality of kaolin, or china clay, then working up the mixture into a suitable consistency with water, and dividing the mass into pieces about the size of a walnut, which are then carefully dried by the aid of a vacuum in a vessel, the temperature of which is very gradually raised at first, and slowly increased till it reaches 100° C, or even somewhat higher. By this means the composition assumes a highly porous and spongy state, combined with a solidity and firmness which enable it to be readily handled and transported as required, without falling to pieces or crumbling.

To accomplish the effectual operation of the process, the chemicals, prepared in the way described above, are put into a series of special retorts, which are suspended from the roof of a gas-furnace. The chamber in which they are placed in the present plant has a capacity for, and contains five retorts, one of which, however, serves as a superheater for the air, as will be presently explained; the remaining four being charged with chemicals. The design chosen is a new departure, the capacity of each retort being probably twelve times that of those adopted in other processes. The retorts are made of cast iron; and each forms practically a large U-tube, having an internal pipe or flue in each limb of the U in a vertical direction, extending from the lower end to the upper. The hot gases of the furnace have free passage through this flue, and so ensure the heat of the furnace being readily communicated to the whole of the chemicals contained in the retort. The conduction of the heat into the heart of the chemicals is further facilitated by having a number of parallel projecting belts or rings at suitable distances apart, round the circumference of the retort, and also a number of other projecting or conducting metal pieces, which assist, by conveying the heat, in keeping the whole at a uniform temperature, and also in strengthening the retorts. The temperature required in the furnace to ensure good results is found to be not higher than a dull red, and insufficient to cause the retorts to be injuriously affected, either by the heat or by the oxidation consequent thereon, during long periods of time. The whole process of causing the chemicals to absorb the oxygen from the atmosphere, and to subsequently evolve them, is automatic in its action, with the exception of the firing of the furnace and steam-boiler.

The arrangements and machinery employed to effect the results are as follows: On the top of the furnace, and resting on substantial girders, which also form the support from which the retorts are hung, are fixed, on opposite sides, two sets of compressing and vacuum pumps. These pumps, being so placed, are in close proximity to their work; thus dispensing with a large quantity of communicating piping, and therefore in like proportion diminishing the risk of dilution of the oxygen produced by residual nitrogen in the piping. But the one great advantage is gained by the use of the large retorts, as only sixteen lids and pipe-joints at the mouths of the retorts have to be made and kept perfect, against twelve times this number, for a similar quantity of chemicals, with small retorts. All the joints are placed so as to be accessible and readily examined; and the quantity of piping used is reduced to the greatest possible extent, to ensure a rich product. Each set of pumps (which may be worked alone or in unison with the other) consists of a series of three cylinders, placed vertically side by side, and having a 2-feet stroke. The exterior ones form the pumps for delivering the air under pressure to the retorts, and the central cylinder in each case acts as the vacuum pump. The air is drawn by the pumps through a vessel containing lime, as, while moisture has no deleterious effect on the chemicals, it is found desirable to extract any acids there may be in the atmosphere, before allowing the air to pass through the retorts. As, however, the carbonic acid in the atmosphere amounts only to about one part in 10,000 parts, half a ton of lime, either in the form of hydrate or as quick-lime, will do duty for an indefinitely long period. The pumps then deliver the air (which, in consequence of the compression it has received, has had its temperature considerably augmented) into the first of the five retorts; passing in its way, however, after leaving the pumps, through a vessel containing caustic soda in lumps, which purifies it from any oily matter with which it may have become contaminated in its passage through the pumps. As before mentioned, the first retort to which it passes does not contain any chemicals, and simply does duty as a superheater; enabling the oxygen to be produced with a much lower furnace temperature, and therefore more economically, than if it were absent. The remaining four retorts are arranged in a series of two pairs, and are so connected that while one pair is absorbing oxygen from air under pressure, the other is evolving oxygen, due to the operation of the vacuum cylinders. There is, therefore, practically a continuous, and not merely an intermittent, flow of the gas. Air under pressure is constantly being delivered to the superheater, and is directed by a valve into one pair of the retorts for about two minutes; the other two giving off oxygen during this period, at the end of which time the air is automatically directed to the other pair of retorts, and those just relieved from pressure at the same time become connected with the vacuum cylinders, and so on, as long as desired. The pressure at which the air shall pass through the retorts is regulated by two small valves, operated by springs, which open, and allow the nitrogen to escape into the atmosphere, at any pre-determined pressure—5 to 10 lbs. per square inch being found, in practice, to give good results.

In order to test the strength of cast-iron vessels, under pressure, when at a red heat, and thus obtain some guide for allowing a good margin of safety, an experiment was made with a specially constructed cast-iron pipe. This was brought to a red heat, and an attempt made to burst it—the experimenters, of course, taking up their positions for observation at a safe distance. A gradually accumulating pressure, up to 450 lbs. per square inch, was reached (this being as high as the particular gauge used would register); but the tube, which was only ½-inch thick, did not burst, or give way in the least. The safety of well-constructed cast-iron retorts was therefore placed beyond doubt. When drawing off the oxygen, all that is evolved passes through an apparatus known as the separator, which allows it and the nitrogen to escape into the atmosphere, until a vacuum of about 25 inches is indicated, when the gas is turned automatically into the holder.

As the plant above described has only very recently been brought into working order, and two out of the four retorts charged with chemicals have exhibited defects, which rendered it necessary to throw them out of action for a time, it is scarcely possible to give any really exact figures as to its capabilities. It may, however, be stated that the two retorts which have been working have yielded a quantity of oxygen, with only one set of pumps in operation, amounting to 7500 cubic feet per 24 hours; and it is reasonably anticipated that with a double set of pumps the production could be increased to 15,000 cubic feet daily. The expenses of the plant, including depreciation, are set down at £1 per diem, assuming the price of coke on the premises to be 7s. 6d. per ton. One labouring man is capable of taking entire charge, as the only work required of him is attention to the fires and the oiling of the machinery—all the other operations being absolutely automatic. Allowing a considerable margin for exigencies, the inventor claims that the cost of production per 1000 cubic feet of gas may be set down at 1s. to 1s. 6d. in the holder for oxygen in a high state of purity; but for commercial purposes, where so great a degree of purity is not essential, the cost might be very materially reduced.

THE LUMINOSITY OF COAL-GAS FLAMES.

At the Meeting of the Chemical Society last Thursday, Mr. W. Foster, M.A., Professor of Chemistry at the Middlesex Hospital, furnished a further contribution to the literature on the above subject. He took exception to some of the conclusions drawn by Professor Vivian B. Lewes in his recent paper before the same Society;* and, in particular, to the latter's assumption that luminosity is due mainly to the combustion of acetylene formed in the inner zone of the flame by the incomplete oxidation of heavier hydrocarbons. Mr. Foster said he had examined the carbon particles (or soot) obtained on cooling a portion of the flame, and had found that they invariably contained hydrogen to the extent of about 1 per cent. This observation had been previously made; but the author differed from earlier investigators in asserting that the hydrogen was not occluded. He pointed out the close similarity in composition between these carbon particles and coke from cane sugar and starch, which likewise contains about 1 per cent. of hydrogen. From the soot obtained on cooling a flame, the hydrogen could, he said, be removed only with difficulty; and its occurrence could scarcely be accidental. From these premisses, Mr. Foster concluded that acetylene could not be the only hydrocarbon present in flame; it being improbable that it could yield on combustion a body in which 8 molecular proportions of carbon were associated with 1 of hydrogen, as was the case with the soot containing approximately 96 parts of carbon to 1 part of hydrogen. An attempt was made to prove the preferential combustion of hydrogen to carbonic oxide; and to this end results obtained on passing mixtures of hydrogen, carbonic oxide, oxygen, and nitrogen (as a diluent) over palladinized asbestos, were quoted. But they were altogether insufficient to give tangible support to the author's contention.

GAS FOR LIGHTHOUSE ILLUMINATION.

At the Meeting of the Institution of Civil Engineers last Tuesday week, a paper on "The Illumination by Gas of Tory Island Lighthouse, County Donegal," was read by Mr. D. C. Salmond, Assoc. M. Inst. C. E. After giving a brief account of the lighthouse as it originally stood, the author proceeded to describe the works which have been carried out in substituting gas for the old oil-light, which was extinguished on the 6th of April, 1887. The new illuminating apparatus is a Wigham triform gas-light of the latest construction, formed by three superincumbent tiers of lenses. In the focus of each tier is placed a 108-jet gas-burner; making, when full on, a total of 324 burners—practically equal to 9000 candles. The hyper-radiant long-focus lenses used are capable of making the light from the three burners equal to about 7,000,000 candles, according to Allard's formula. The construction of the lenticular apparatus was described, as also the devices for producing "group flashing." Groups of flashes are produced by breaking up the full beam from the lens by continually shutting off and turning on the gas. This is accomplished by a cam, fixed on the rotating clockwork placed under the lens-table, from which a connecting rod rises up through the lantern, shutting and opening the valves of each burner at the same moment. The result is that the mariner sees a group of shorter flashes instead of one long flash. A detailed account was given of the various operations rendered necessary in removing the old lantern. This was done without causing any interruption in the light—a temporary lantern, similar in arrangement to those used in lightships, having been employed in the interval between the extinction of the oil-lamp and the illumination by gas. A salient feature of the light station on Tory Island is the gas-making plant. This comprises a bench of seven cast-iron Ω-shaped retorts set in fire-bricks and tiles built in fire-clay. The mouthpieces of the retorts project 10 inches, and have faucets cast on them to take the ascension-pipes. These are of ¾-inch metal, and tapered from 4 to 5 inches in diameter; being connected with a 12-inch hydraulic main over the bench. The gas from the hydraulic main passes into a condenser, and then by a 4-inch pipe to the vertical scrubber. From the scrubber the gas proceeds to two dry lime purifiers, and thence to the meter, which is capable of passing 1000 cubic feet per hour; and it finally reaches the gasholders—two in number, each 25 feet in diameter and 10 feet deep, with a rise of roof of 1 ft. 9 in. The framing of the holders consists of four cast-iron columns 12 inches in diameter and 9 feet high, bolted down to piers in the walls of the tank. In case of breakdown of the gas apparatus, an arrangement is provided whereby, in a few seconds, a six-wick oil-light can be substituted for the bottom gas-light. The oil-light can be shut off by clappers made to open and close round the light, so that the group-flashing system is retained.

Honorarium to Mr. H. Willis Smith.—The shareholders of the Caterham Gas Company, at their recent general meeting, voted to Mr. Henry Willis Smith an honorarium of 25 guineas, on his leaving the Company's service, to take the supervision of the Singapore Gas Company's works, as mentioned in the JOURNAL a few weeks ago.

* Also in the pa[illegible]read at the London Institution on the 18th ult. (*ante*, p. 338).

REGISTER OF PATENTS.

Gas Motor Engines.—Williams, H., of Stockport. No. 1299; Jan. 24, 1891. [8d.]

This invention relates to improvements in gas motor engines with the "Otto" cycle of operations; and it consists chiefly in certain combinations and arrangements of parts, particularly in the timing or setting of the ignition-valve relatively to the other valves.

In an "Otto" engine, the piston on its outstroke draws in a charge of explosive mixture, which it compresses on its instroke; the charge being then ignited and the piston receiving an impulse during its next outstroke, and on its instroke the waste products are expelled. It is obvious, says the patentee, that an important feature is the opening and closing of the several valves at the proper time respectively; and one part of the present improvements consists in so setting and timing the ignition-valve that it is opened, and a charge fired, at the moment when the engine is at or about its dead centre. To accomplish this and to work the other valves, a side shaft is employed, driven from the crank-shaft of the engine; and upon this side shaft four cams are secured, each of which operates one of the pivoted levers, of which there are four—one for each of the four valves: *i.e.*, the gas admission-valve, the air admission-valve, the ignition-valve, and the exhaust-valve.

Another feature of the improvements consists in the application of a starting-valve in connection with the combustion chamber. This valve is controlled by hand, and is opened when the engine is to be started, so as to permit the unexploded charges of combustible mixture to be discharged through it instead of through the ordinary exhaust-valve. The valve is so arranged as to close automatically, and so prevent air being drawn into the cylinder on the outstroke of the piston; and the valve is closed, and kept closed, after the engine has been started.

Lamps for Increasing the Illuminating Power of Lighthouses.—Wigham, J. R., of Dublin. No. 2247; Feb. 7, 1891. [8d.]

The patentee proposes to encase lighthouse burners—either Argand burners with concentric rings or groups of fishtail burners, ring-burners, Argand burners, and the other burners like those described in patents Nos. 945 of 1865, 2871 of 1866, 3771 of 1869, 1015 of 1872, and 1160 of 1879—in cylindrical or polygonal annealed glass frames or globes or frames partly of glass and partly of iron or other metal (this description not including what are generally known as chimney glasses). These frames or globes are surmounted with regenerating apparatus constructed upon any of the well-known plans for transmitting hot air, automatically heated by the products of the combustion of the burners, into the frames, so as to feed the combustion with pure air heated to a high temperature, in order to give to the light great intensity and steadiness.

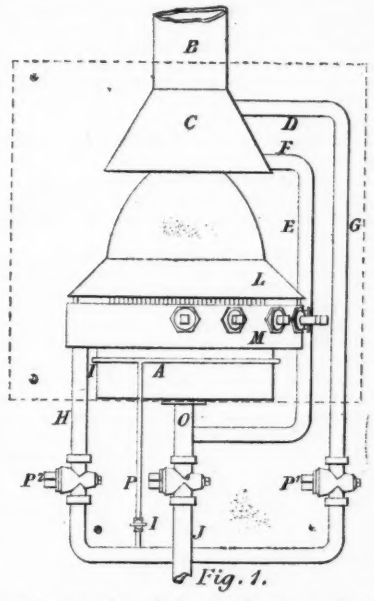


Fig. 1.

Below the casing a receiver A (made of copper or other metal) is placed containing solid naphthalene or other hydrocarbon. The gas enters by the pipe J; and, through the cock P¹ and the pipe G D, is led to a double chamber (of copper or other metal) of conical or other shape C, divided internally so as to compel the gas to travel round it to become thoroughly heated by the flame and products of combustion. From this chamber the heated gas is conveyed, by the pipe F E, through a central pipe O, to the surface of the naphthalene, from which it is conveyed by three-way cocks M to the burner. These cocks also communicate with a narrow chamber K, placed immediately above the chamber A, and filled with ordinary gas fed into it, by the pipe H, through the cock P². By these means naphthalized gas, or ordinary gas, or a mixture of both in such proportion as may be required, can be admitted to the burner. The naphthalene or other hydrocarbon is vapourized either by the hot gas above mentioned or by an external application of heat arranged for the purpose (shown by the letter I in fig. 1); and the flame thus increased in illuminating power is used either with or without the casing indicated by dotted lines in fig. 1, and by Z in fig. 2.

In the drawing A is the receiver for solid naphthalene or other hydrocarbon; B, the flue to carry off the products of combustion; C, a double copper cone divided internally so as to compel the gas entering it, by the pipe D G, to travel round it to be evenly heated; E F, the

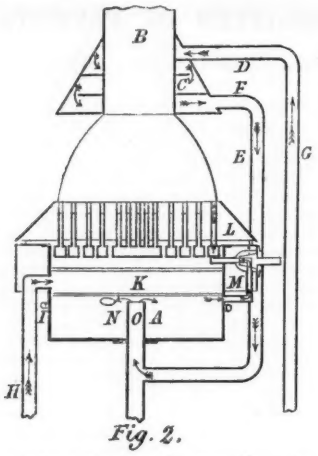


Fig. 2.

pipe to convey heated gas from the chamber C to the receiver A; H, the pipe for allowing ordinary gas to enter the chamber K; I, a pipe for the external application of heat, the jets of which pointing inward do not show; J, a general inlet-pipe; L, a cone of copper, nickel, or other material placed round the burner for the purpose of equalizing the supply of air thereto; M, five three-way cocks, by which nahpthalized gas or ordinary gas or both can be admitted at pleasure to the burner; N, a feeding-screw; and O, the central tube by which heated gas is admitted to the receiver, and when necessary a certain proportion of cold gas by means of the central cock P, which cock, however, is under ordinary circumstances kept closed, the other cocks P^1 and P^2 being open.

Condensing and Utilizing the Residue of Gases Exploded to Form a Vacuum in Engines Propelled by Gas or other Explosive Material.—Trewhella, J., of Wargrave. No. 3948; March 5, 1891. [6d.]

In order to carry out his invention, the patentee proposes to construct an encased cylinder, the outer casing enclosing which has compartments, some filled with water, others with non-conducting material, and with passages controlled by valves and arrangements for working them, and leading to the eduction-pipe of the motor cylinder. To the condensing cylinder is fitted a piston displacer, which is moved by a suitable arrangement with each or every alternate revolution of the crank, as desired, for producing a partial vacuum, which may act on the piston of the motor alternately or simultaneously, as may be best adapted to the construction of the engine to which it is applied. The objects of this invention are to economize the explosive material, and to render the explosion more effective.

Gas-Engines.—Lanchester, F. W., of Bedford Row, W.C. No. 4222; March 10, 1891. [8d.]

This invention relates to improvements in the type of gas-engines described in patent No. 19,868 of 1889; and it consists in various details applicable to that type of engine, and in some cases to other types of engine.

One part of the invention relates to improvements in the governing-valve described in the 1889 patent. This valve acts by change in the rate of flow of the compressed gases which, passing into a chamber, causes the valve to cut off flame communication between the contents of the cylinder and the igniter tube. The improvement is intended to make the valve more rapid and sensitive in its governing action, by reducing its weight and increasing the rate of its fall under the action of gravity, by adding to or aiding the pull of gravity by the pull of a permanent or other magnet. In one mode of carrying the invention into effect, a permanent magnet of the double bar or horse-shoe type is attached under the valve in such a manner that the magnet attracts the valve, which is then made preferably of soft wrought iron; and the pull of the magnet upon the valve is varied either by adjusting and changing the distance of the poles from the valve, or by sliding between the poles (in contact with both bars) a wrought-iron keeper, piece. The position of this keeper-piece relative to the poles determines the amount of attraction which the magnet is allowed to exercise; and suitable graduations and stops are provided to enable the speed of the engine to be varied by altering the position of the sliding keeper-piece. When the engine is out of action, it is preferred to place the keeper-piece at the extremity of the magnet poles, so as to enable the magnet to retain its intensity without change.

Another part of the invention relates to the construction of an automatic inlet gas and air valve in the following manner: The valve is of the conical seated type with gas-holes in the seat; and instead of constructing the valve-seats in the ordinary manner, with a uniform upper and lower seat below the gas-holes, the seat is cut away at its lower part, leaving only sufficient valve-seat face around each hole to keep gas-tight when the valve is closed. The valve face thus consists of an upper face with lower projections or reticulations in which the gas-holes are placed. This arrangement of valve-seat prevents inconvenience from leakage back from the engine cylinder by allowing any such leakage free access to the air inlet-pipe without any undue tendency to blow back into the gas-supply pipe. In some cases a groove is cut round the upper part of the seat above the gas-holes; and apertures, opening from this groove to the passage, are provided, so as to entirely prevent, if desired, any leakage from the cylinder from finding a passage into the gas-pipe. This method is also applicable to any seat dividing the gas-supply pipe or channel from the explosion chamber.

Another part of this invention relates to the automatic exhaust-valve described in the earlier patent; and it consists in the addition of a blow-off valve attached to the exhaust chamber, from which the exhaust-valve piston is operated. This valve is intended to relieve any undue pressure produced in that chamber by leakage from the cylinder through the exhaust-valve, and which leakage, if considerable, might open the exhaust-valve at a wrong time. The blow-off valve is loaded by a spring, lever, weight, or in any other suitable manner.

Purification of Water and Producer Gas from Sulphur Compounds.—Claus, C. F., of Hammersmith. No. 4279; March 10, 1891. [6d.]

These improvements relate to the purification of water gas and other producer gas from sulphide of hydrogen, bisulphide of carbon, and other sulphur compounds, in the following manner: When the gas, as it leaves the "producer" (that is to say, at a temperature of about from 500 to 700° C.), is passed through or in contact with pieces of hot metals, such as copper or iron, the sulphur compounds contained in it are decomposed, and sulphides of these metals are formed; and this fact is made use of in this purification process. The metals may be employed in the form of granules or scrap; the form preferred being the finely-divided state in which they are produced by the action of hydrogen or water gas on their oxides—that is to say, in the form of metallic sponge, in which condition they present the largest amount of surface to the gas passing through or in contact with them. The metals, in either of these forms, are placed in receptacles of iron (such as cylinders or boxes) set in brickwork, so that they can be heated from the outside, or they may be cylinders or boxes lined thickly with brickwork, so that they may be heated by hot gases internally; this heating being necessary when first starting the process. When once in full operation, the heat required for the process is maintained by the hot gas passing through and by the action taking place within them. Of these "purifiers" at least two are required. It is better, however, says the patentee, to employ a greater number; and gas-connections from the "producer" to and through them are made in such a manner that, according to requirement, the gas can pass through either one or other of them. The water gas passing hot through these receptacles or purifiers is deprived of, or purified from, the sulphur compounds contained in it; and after a certain quantity of hot water gas has passed through the iron sponge or copper sponge contained in either of the purifiers, and the metals have thereby to a considerable extent been converted into sulphides and spent, this purifier is disconnected from the gas supply at both the inlet and outlet, and the gas is passed through another fresh purifier. Through the purifier containing the spent or partly spent purifying materials, either cold or heated air is now passed, until all the sulphur combined with the metal has been expelled or roasted off, by which process the sulphides of the metal are converted into oxides.

To bring the oxides back to the metallic state, and to again render the reduced metals available for purifying further quantities of water gas, either cold or hot water gas is passed through them—that is to say, water gas of a temperature most suitable for the reduction. The gas direct from the producer being hotter than is necessary for this purpose, cold gas may be admitted along with it. The residual gas from this operation may be used as fuel, or for other purposes. When the purifying property of the material in the first purifier has thus been restored, this purifier may be again connected with the supply of hot impure water gas, whilst the material in the second purifier, which has meanwhile been in use for this purpose, is being revivified. In this manner, the operation is repeated again and again.

Gas Motor Engines.—Campbell, H., of Halifax. No. 4355; March 11 1891. [6d.]

According to the present construction of gas-engines, says the patentee, the explosive mixture passes in a stream direct from the ignition chamber to the compression chamber, and intermingles with the spent gases therein, whereby the unspent gases are weakened and the power obtained therefrom is lessened.

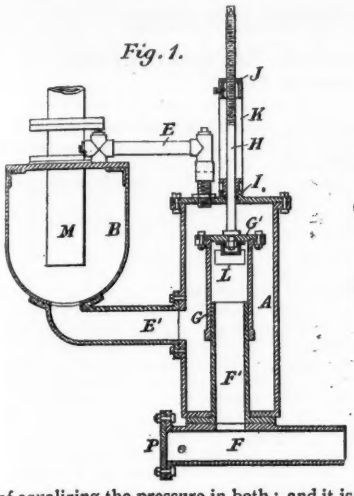
The object of the present invention is to obtain the greatest possible force of the gases; and this is accomplished by their more equal distribution by employing a disc or plate occupying a position between the ignition chamber and the compression chamber, so that as the gases enter they impinge against it, and are distributed, and enter the compression chamber in a more diffused state, by which means their strength is better maintained. The distributing disc may be perforated, or it may be made from fine wire gauze, so as to permit the gases to pass through in a diffused stream.

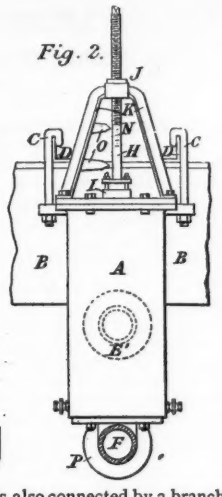
Light-Projectors for Street-Lamps.—Nieuwenhuys, A., of Brussels. No. 4607; March 14, 1891. [8d.]

In a former patent, the inventor described a construction of glass lenses or light-projectors for street and other lamps, constructed as inverted truncated cones, surrounding the lower part of the lamp; the sides of the cones being formed as bi-convex lenses, whereby the light of the lamp was thrown in a more or less concentrated manner upon the road or floor in immediate proximity to the lamp. According to the present invention, instead of constructing the lenses or projectors of a bi-convex form, they are made as "plano-convex" lenses—that is to say, the face presented to the lamp burner is made a compound plane surface, while the outer surface is convex. By this construction, while still obtaining an effective distribution of the light, the weight of the projector is reduced to about one-half, and, in addition, the manufacture is greatly facilitated.

Regulating the Seal in, and Drawing off Tar and Liquor from, Hydraulic Mains.—Hislop, G. R., of Paisley. No. 22,810; Dec. 31, 1891. [8d.]

This invention has for its object to afford greater facility for regulating the hydraulic main seal in gas-works, and also to afford means for shutting off communication of the main with the discharge-pipe without the use of stopcocks. As shown in the engraving, the apparatus consists of a vessel A (preferably cylindrical in form), suspended at one side of the hydraulic main B by hooks or catches C taking over angle-iron bars D bolted to the top of the main. At its upper end it is connected by a pipe E to the top of the hydraulic main, for the purpose





of equalizing the pressure in both; and it is also connected by a branch E^1 to the bottom of the main. To the lower part of the vessel a flanged T pipe F is secured; the vertical branch F^1 of the pipe passing up through the centre of the vessel to such a height that its upper end is about level with the bottom of the main B, so as to be capable of drawing off the whole of the tar and liquor therefrom. Over the upper end of the branch F^1 (which is turned true externally), a hollow piston G is fitted; the piston being bored out to receive the branch and render it tar and water tight. The upper end of the piston is closed by a faced flange plate G^1, bolted to a faced flange on the piston; and in the centre of the plate, a spindle or lifting-rod H is secured, screwed at its upper end, and passing through a stuffing-box I in the cover of the vessel, and thence through a tapped nut J carried by a saddle or bracket K bolted to the cover. The piston has openings or ports L made near its upper end, through which the tar and liquor flows from the interior of A into the pipe F, and thence away from the plant; the depth of seal in the main above the bottom of the dip-pipe M being regulated by the height of the undersides or lips of the openings L above the bottom of M. The spindle H regulating the position of the piston has a scale marked upon it, which (in conjunction with pointers on the bracket K) indicates the depth of seal or whether the main is empty, which it is when the piston G is screwed down until the ports L are opposite the upper end of the branch F^1. When the ports are below the level of the upper end of the branch F^1, and the underside of the cover G is screwed down against the upper edge of the branch, the piston is out of action.

The apparatus has claimed for it the following advantages: First, it provides for the accurate adjustment of the depth of seal above the bottom of the dip-pipe M. Second, it enables the hydraulic main to be flushed or emptied at pleasure. Third, by screwing down the hollow piston until its cover G^1 bears upon the upper end of the branch F^1, communication between the main B and the pipe F is shut off, and by removing the flange P on the end of the pipe F, access can be had for the purpose of cleaning it out, and that without the employment of any stopcocks, or interfering with the regular working of the main; also, by removing the cover of A and weighting down the piston G, access can be had to the interior of the vessel. The vessel A is furnished with stopcocks at its lower end, for the admission of steam or hot water when required.

APPLICATIONS FOR LETTERS PATENT.

3417.—Humpidge, H. T. and J. D., and Snoxell, G. E., "Gas motor engines." Feb. 22.

3482.—Moeller, J., "Incandescent gas-lamps." Feb. 23.

3522.—Imray, O., "Electrical igniting devices for gas-lamps." A communication from C. Wasmuth. Feb. 23.

3554.—Leigh, H. H., "Gas-heating burners." A communication from J. A. Elsner and L. Grambow.

3556.—Wright, F., "Dry gas-meters." Feb. 23.

3574.—Robert, A., "Gas-engines." Feb. 23.

3814.—Glover, S. and T., and Critchley, J., "Coin-freed attachment for gas and other meters." Feb. 27.

3866.—Smethurst, W., "Applying combustible mixtures of air and gas or inflammable vapour to driving motive-power engines, &c." Feb. 27.

3047.—Instone, A. J., "Oil or gas engine." Feb. 16.

3068.—Butterworth, E., "Gas motor engines." Feb. 17.

3203.—Pinkney, C. W., "Gas-engines." Feb. 18.

3292.—Czermak, F., Bergl, A., and Hutter, H., "Gas motor engines." Feb. 19.

3305.—Sapori, O., "Manufacture and utilization of gas, and apparatus therefor." Feb. 19.

3326.—Addie, J., and Cuninghame, J., "Treatment of spent lime and gas liquors and of blast-furnace and other gases for the recovery of cyanides therefrom." Feb. 20.

3354.—Rouzee, G. L. V., "Flame regulators for lighting and heating apparatus." Feb. 20.

3367.—Barr, J., "Gas-valves for regenerative furnaces." Feb. 21.

Coal in the North of Ireland.—For some time past mining operations have been carried on near Dungannon, with a view of developing the discovery of coal recently made in that district. The coal found is stated to be of excellent quality; and, as the shafts sunk are close to the Great Northern of Ireland Railway, the undertaking is likely to be a profitable one.

CORRESPONDENCE.

[We are not responsible for opinions expressed by correspondents.]

The English Gas Coke Trade.

Sir,—The Chairmen and Directors of the English gas companies appear, from the reports of general meetings, to be exercised in their minds as to what is eventually to become of their coke; and they point with regret to the residuals balance-sheet. But they are not the only sufferers from a plethora of coke; for we poor people on this side of the Channel have had our markets absolutely ruined of late years by imported English coke, which has been poured into Hamburg and the Danish and Baltic ports in thousands of tons. I cannot quite make out what policy the English companies pursue when disposing of their residuals; but it appears to us that, as long as they obtain fair local prices, they do not mind what price, however low, they get for coke destined for export, provided their yards are kept clear. Consequently, it is poured into our markets at a price below its real value; thus ruining our local trade, and yielding the English directors themselves very little profit—the only people really profiting being the middlemen.

Now, this is all very well, or rather all very bad; and we are compelled to ask the question: If coke is in such demand in Denmark, Germany, and the Baltic provinces, that they can absorb thousands of tons annually beyond the considerable supply from local gas-works, salt-works, &c., why do not the English companies do something to encourage a similar demand, by exhibiting models of the many excellent slow-combustion coke-stoves in use generally on the Continent and in America? The Paris Gas Company have done much in this direction; and I have before me a book, with beautiful lithographed drawings, of the stoves recommended and sold by that Company, who attach as much importance to this question as the English companies do to gas-cooking stoves.

Of course, I know that people say: "Oh! deliver us from the awful German stove, with its sarcophagus-like appearance, and give us the cheery English fireplace." But, on the other hand, the Continental says: "Oh! deliver *us* from the wasteful English air-polluting fireplace, only fitted to warm certain portions of the anatomy of the British paterfamilias, posed in front of it in the graceful attitude so peculiarly English." I know full well the prejudice against the closed stove; but I maintain that the prejudice can be overcome if the English public were fully acquainted—first, with the fact that they can be obtained in every variety of form, and of artistic merit; and, secondly, that they are economical beyond comparison with the open English fireplace. With the closed stove, the heat can be regulated to a nicety, and the combustion is perfect—no smoke being given off; and they can be made to do duty as excellent ventilators, if properly fixed.

Compare Hamburg, Berlin, Frankfort, Copenhagen, Paris, and other Continental cities, with London, Birmingham, &c.; and although in the former there are as many—in fact, more—chimneys per square mile, for the people are packed together in huge complex buildings upon the "flat" system, the atmosphere is bright, and the yellow London fog is unknown. There can be no doubt that the English domestic chimney is the chief culprit in producing the terrible London fog; and it is nonsense to talk of expensive anthracite when you have an almost smokeless and cheap fuel in the form of coke.

The English gas companies depend upon the cement factories to relieve them of their surplus coke. Well, this is a broken reed to lean upon, for the foreign competition with the English cement trade is, I regret to say, becoming daily keener; and it appears that the chances of being able to dispose of large quantities of coke are becoming less as the new methods of cement fabrication are coming into vogue.

Much may be done by the English gas companies to popularize the use of coke in closed stoves. Grateful shareholders will thank the directors, grateful London will thank them, and grateful gas managers on the Continent (whose markets are being ruined), will thank them too. With such a glorious laurel-wreath of thanks to be earned in the future, how great should be their efforts to do something.

Danish Gas Company, Copenhagen, Feb. 26, 1892. F. D. Marshall.

The Inclination of Foul Mains.

Sir,—I am much gratified to learn, from the Inaugural Address recently delivered to the Manchester District Institution of Gas Engineers by Mr. Charles Armitage, of Lancaster, that his experiences fully support the views on the above subject laid down in my book on "The Chemistry of Gas Lighting," and also embodied in a paper read before the South-West of England District Association of Gas Managers on Sept. 9, 1890. The latter included illustrations of four foul mains as erected by me, at various gas-works in the neighbourhood of Salisbury, on the principle of an incline towards the hydraulic. It will be seen, by referring to the discussion on this paper, that the idea was objected to by several speakers; and I believe the prevalent practice still tends the other way.

Gas-Works, Salisbury, March 2, 1892. N. H. Humphrys.

Electric Lighting for Worcester.—At a recent meeting of the Worcester Watch Committee, it was reported that fifteen tenders had been received for the supply of electric lighting under the Provisional Order of the Corporation, and that Mr. W. H. Preece had been engaged to advise the Council as to the tenders.

A Gas-Stove Shattered by an Explosion of Gas.—Some consternation was caused in the eating-house establishment of a Mr. Worters, of Mercery Lane, Canterbury, yesterday week, by an explosion of gas. It seems that the tap supplying gas to the inside of a cooking-stove was accidentally turned on. The interior soon became filled with gas, which began to escape through the ventilator, which was in close proximity to a lighted jet on the top of the stove. An explosion naturally followed, the force of which may be imagined from the fact that the stove was blown to pieces, and several panes of glass removed from the window. Most fortunately, at the time no one was in the neighbourhood of the stove.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

The following progress was made with Bills last week:—

Further Standing Orders complied with: Bristol Gas Bill; Cleator Moor Local Board (Gas) Bill.

Bills read a second time: Bristol Gas Bill; Cleator Moor Local Board (Gas) Bill.

Bills committed: Ashton-under-Lyne, Stalybridge, and Dukinfield (District) Water Bill; Barrow-in-Furness Corporation Water Bill; Bradford Corporation Water Bill; Glasgow Corporation Water Bill; Ipswich Corporation Bill; Kilmarnock Corporation Water Bill; Liverpool United Gas Bill; Newport Corporation Bill; North Shields Water Bill; Oxford Gas Bill; Pontypridd Water Bill; Rhymney Valley Gas and Water Bill; Swansea Corporation Water Bill; Tredegar Local Board Water Bill; Southborough Local Board (Gas) Bill; Swinton and Pendlebury Local Board Bill; Uttoxeter Water Bill; Western Valleys (Mon.) Water (Gas Purchase) Bill.

Petitions against the following Bills have been presented:—

Ashton-under-Lyne, Stalybridge, and Dukinfield (District) Water Bill, from the Guardians of the Poor of the Saddleworth Township.

Barrow-in-Furness Corporation Water Bill, from the Dalton-in-Furness Local Board and Victor C. W. Cavendish.

Bradford Corporation Water Bill, from the Liversedge Local Board and Lord Hothfield.

Glasgow Corporation Water Bill, from the Magistrates and Commissioners of Police of the Burghs of Govan and Partick.

Liverpool United Gas Bill, from the Corporation of Liverpool.

North Shields Water Bill, from the Corporation of Tynemouth, the Newcastle and Gateshead Water Company, the Whitley and Monkseaton Local Board, the Tynemouth Union Rural Sanitary Authority, and the Duke of Northumberland.

Oxford Gas Bill, from the Corporation of Oxford.

Pontypridd Water Bill, from the Local Boards of Pontypridd and Ystradyfodwg, and the Proprietors of the Glamorganshire Canal Navigation.

Rhymney Valley Gas and Water Bill, from the Promoters of the Llanbradach District and Aber Valley Water Bill.

Swansea Corporation Water Bill, from the Monmouthshire County Council and the Swansea Rural Sanitary Authority.

Swinton and Pendlebury Local Board Bill, from the Corporations of Manchester and Salford and the Local Boards of Little Hulton, Barton, Eccles, Winton, and Monton.

Tredegar Local Board Water Bill, from the Ebbw Vale Local Board.

Uttoxeter Water Bill, from the Derbyshire and Staffordshire County Councils.

Western Valleys (Mon.) Water (Gas Purchase) Bill, from the Local Board of Bedwellty and the Blackwood Gas and Water Company.

HOUSE OF COMMONS.

The following progress was made with Bills last week:—

Bills read a second time, and committed: Airdrie and Coatbridge Water Bill; Blackpool Improvement Bill; East Grinstead Gas and Water Bill; Exmouth and District Water Bill; Ormskirk Gas Bill.

Bill withdrawn: Sunderland and South Shields Water Bill.

Petitions against the following Bills have been presented:—

Birmingham Corporation Water Bill, from Owners of Property in Birmingham and other places, and also along the proposed line of pipes.

Blackpool Improvement Bill, from the Fylde Water-Works Company.

East Grinstead Gas and Water Bill, from Owners, &c., of property.

Exmouth and District Water Bill, from the Budleigh Salterton Local Board.

London County Council (General Powers) Bill, from the New River and Kent Water Companies.

London County Council (Subways) Bill, from the Kent Water Company.

Mold Water Bill, from the Hawarden and District Water-Works Company.

Newcastle-upon-Tyne Improvement Bill, from the Corporation of Tynemouth.

Pontypool Gas and Water Bill, from the Abersychan Local Board, the Blaenavon Gas Company, and the Marquis of Abergavenny.

Proposed Extension of the Teignmouth Gas-Works.—The Teignmouth Local Board yesterday week considered a report presented by the Gas Manager (Mr. Portbury) with reference to the extension of the gas-works, which proposed an outlay of £12,544, which, with the addition of the lighting of Shaldon, would bring the sum up to £14,025. After a good deal of discussion, the matter was referred to Committee.

Increase in Price by the Crystal Palace Gas Company.—The Secretary of the Crystal Palace District Gas Company (Mr. Magnus Ohren) has announced that, in consequence of the continued high price of coal and labour, and the low price of coke, the Directors exceedingly regret that an increase in the price of gas has become absolutely necessary. They therefore give notice that the price of gas will be raised to 2s. 9d. per 1000 cubic feet from and after the dates of the present quarterly accounts.

LEGAL INTELLIGENCE.

HIGH COURT OF JUSTICE—CHANCERY DIVISION.

Saturday, Feb. 27.

(*Before Mr. Justice* KEKEWICH.)

In re the Incandescent Gas-Light Company (Limited and Reduced).

This was a petition for the reduction of the Company's capital by a sum of £10,000, which it was alleged was not represented by available assets. The reduction was in respect of the ordinary shares, and did not affect the preference shares.

Mr. RENSHAW, Q.C., and Mr. BRAMWELL DAVIS appeared for the Company.

His LORDSHIP made the order.

In re the Selby Gas Company.

This was a petition of an unusual character, for the restoration to the register of joint-stock companies of this Company; it having been struck off by the Registrar, pursuant to section 7 of the Companies' Act, 1880. The notices prescribed by that section had been duly sent by the Registrar to the Secretary of the Company, but had not been brought by him to the attention of the Directors; and, in consequence, the Registrar had struck the Company off the register. The Company had gone into voluntary liquidation, having made a beneficial sale of its undertaking to the Local Board; and, upon the resolution for the voluntary liquidation being communicated to the Registrar, it was discovered that the Company had ceased to exist, and the Local Board, before completion, required the name to be restored to the register.

Mr. BRAMWELL DAVIS appeared for the petitioners.

Mr. INGLE JOYCE, for the Registrar, said he did not object to the restoration, provided the liquidator of the Company would undertake to comply with the requirements of the Companies' Act as to notices to shareholders.

His LORDSHIP, upon such undertaking being given, made the order asked for.

HIGH COURT OF JUSTICE—QUEEN'S BENCH DIVISION.

Monday, Feb. 22.

(*Before Justices* WRIGHT *and* COLLINS.)

The Mayor and Corporation of Tynemouth v. North Shields Water-Works Company.

This action, which came before the Divisional Court, was brought to restrain the defendants, by injunction, from obtaining water from certain alleged impure and dangerous sources of supply.

Mr. FINLAY, Q.C., and Mr. CHITTY appeared for the plaintiffs; Mr. LAWSON WALTON, Q.C., and Mr. ROBSON, Q.C., for the defendants.

Mr. WALTON stated that, before going into an expensive issue as to the character and quality of the water, and the source from which it was obtained, they desired to raise a preliminary question whether any cause of action was disclosed in the plaintiffs' statement of claim. The necessity of a lengthened trial would be obviated if the defendants were right in their view. The plaintiffs, who were sueing on public grounds, as though in the name of the Attorney-General, were the Urban Sanitary Authority of the Borough of Tynemouth, and had imposed upon them the duty of seeing that the district had a wholesome supply of water. The defendants were incorporated, under an Act passed in 1876, for the purpose of supplying North Shields and the shipping resorting thereto with water—Tynemouth being included in their district. By that Act one of the sources from which they were empowered to obtain their supply was a watercourse into which the owners of the Charnworth pit or colliery were pumping. The defendants were conducting this water by mains to their reservoirs; and it was then sent out to the inhabitants for domestic use. It was alleged that the water thus delivered was unwholesome and impure, was unfit for either drinking or domestic purposes, and was dangerous to the health of the inhabitants of the borough. The defendants, it was alleged, were not authorized to take water pumped from the colliery. Damages generally were claimed to the amount of £1000. A summons was taken out by the defendants for particulars of the pollution indicated, and its nature; and some were given. They related to the degree to which the water was said to be polluted by the presence of certain salts; but it was not alleged that anything in the nature of special damage or illness had been occasioned in the borough. The preliminary objection raised was that absolutely no ground existed for saying that the Tynemouth Sanitary Authority had imposed upon them the statutory duty of enforcing the supply of water by a Water Company in accordance with its Act of Parliament.

Mr. FINLAY explained that the meaning of the statement of claim was that, under the Public Health Act, if the supply of water was not sufficient, they might be compelled to execute other works.

Mr. WALTON said that no doubt it was the duty of the Sanitary Authority to see that a proper supply of water was furnished to the borough; but by the Public Health Act the mode in which that was to be carried out was prescribed. They were empowered themselves to arrange for the supply of water; and if they had cause to complain of the quality of that which was given by an existing water company, the dispute might be referred to arbitration. If the result of the arbitration was to show that the present water supply was insufficient, they had power to obtain their own. Section 51 of the Public Health Act enacted that any Urban Sanitary Authority might provide their district, or any part thereof, and any rural authority might provide their district, or any contributory place, with a supply of water proper and sufficient for both public and private purposes, and for this purpose might dig wells, construct water-works, and do any acts that might be necessary. No power was there given of ensuring an adequate supply of "wholesome water" by bringing an action against an existing water company. The present action was an entirely new departure on the part of the Local Authority. What they were complaining of had gone on for some years; and the Company had a Bill now before Parliament for the purpose of obtaining extended powers in reference to their water supply, and that would probably dispose of the whole difficulty. It was alleged that

the Company were exceeding their authority by taking water from places outside their area; and this was an action, in the nature of an information on public grounds, by the Attorney-General. But the Law Officers of the Crown would, of course, not interfere unless what was complained of would be likely to have results dangerous to the public health.

Their LORDSHIPS suggested that the matter should be allowed to stand over, to await the result of the application for the new Bill.

Mr. FINLAY said it was very important that the action should be proceeded with at once. If it were tried at the forthcoming Spring Assizes, he would consent that every point of law which the plaintiffs might wish to raise should remain open to them.

Justice WRIGHT thought the parties would have to consider the advisability of adding the Attorney-General as a party to the action.

Mr. FINLAY admitted that it would be prudent to do so, if it could be done without throwing the case over the Spring Assizes.

Mr. WALTON urged that it should be allowed to stand over until after the parliamentary inquiry was completed, as the whole matter would then be dealt with, and the action probably be discontinued.

Mr. FINLAY was willing to consent, if the defendants would give an undertaking not to draw water from the watercourse in question, which was the channel for the drainage from the colliery mentioned.

Mr. WALTON said at present this feed-water was passed into a reservoir which was not being used at all; but the existing water supply was so precarious that it might have to be drawn upon at any time.

Mr. FINLAY: We should be better without any water at all than having it supplied to us from this source.

Mr. WALTON said the present condition of things had subsisted since 1885; and it was very curious that, now that parliamentary action was being taken, the plaintiffs should so suddenly profess to have discovered the noxious character of this water. It was difficult to see any reason for this action but a collateral one connected with the application to Parliament. It appeared that there was some question about the purchase of the Water Company's rights by the Corporation; and, in fact, many vexed questions between the parties would have to be disposed of. Under the circumstances, the Court would probably not assume that any very serious grievance existed in this case, and that the professed anxiety of the plaintiffs had evidently only become acute in view of the legislation about to be invoked.

Mr. FINLAY: The matter is really urgent, for whenever the Company run short of water they fill up with this "stuff."

Mr. WALTON protested against this portion of the Company's supply being called "stuff." No kind of danger was alleged from its use; and as, if the general supply ran short, water might have to be drawn from the reservoir, the Company could not give the undertaking asked for. This question had been made the subject of a poll of the inhabitants; and their opinion had certainly not been expressed in favour of the steps taken by the Local Authority.

Tuesday, Feb. 23.

On the hearing of the case being resumed to-day,

Justice WRIGHT asked whether there was anything in the Private Act which obliged the defendants to supply water at all.

Mr. WALTON said there was not.

Mr. FINLAY said he should refer to the Tynemouth Improvement Act as imposing an obligation in this respect.

Justice COLLINS: You do supply water for the purpose of drinking, and accept payment for it?

Mr. WALTON: We do.

Justice COLLINS: Then is there not an obligation to supply pure water?

Mr. WALTON said he thought not. The mode in which the water was supplied was as follows: The Company laid their mains down a street, and private owners might, if they agreed with the Company, connect a private pipe of their own with the main; the amount payable being assessed by the size of the bore of the private pipe at the point at which it entered the main. The Tynemouth Improvement Act applied where the Company objected to afford a supply. They were not compelled to supply water for cattle, trade, or agricultural purposes. The obligation between the Company and the customer, the moment the supply was carried out, was not in any way affected by the Tynemouth Improvement Act.

Justice COLLINS: If there is an obligation to supply water, does not that import an obligation to deliver water fit to drink?

Mr. WALTON submitted that there was no implied warranty. Water could not be said to be a manufactured article. All the Company supplied was fresh water, taken from springs and streams. This water was put into the mains; and persons could take it or leave it. If they took it, the fact that the Company arranged the price imported no undertaking that the water should be perfectly pure. If it could be shown that the Company were under an obligation to continue to supply pure and wholesome water, then it might be worth while discussing as to the character of the water; but if the Company were under no obligation, and customers could put an end to the state of things by refusing to take the water, and get a sufficient supply by aid of the Public Health Act, then they would have no remedy in the present action. No sort of ground was alleged in the statement of claim for any of the relief which the plaintiffs claimed. Putting it at the outside, the only contract which could be suggested was a contract such as might be established with any tradesman selling goods. If an injunction could not be insisted upon, there was no substance in the action, which had merely been brought to attempt to evade the obligation imposed upon the Corporation by section 52.

Justice COLLINS: It might take them some time before they could get another supply.

Mr. WALTON: I suppose it would; but it would also take the Company some time to erect the necessary works if they were put under an injunction.

Justice WRIGHT: The way in which it strikes me is this: I think there is no cause of action upon the pleadings; but I should certainly not dismiss the action because the pleadings are not properly drawn. My learned brother thinks that a cause of action can probably be picked out of the pleadings, therefore he also would not dismiss the action. Is it of any use, in the state of things, expressing an opinion on the mere pleadings?

Mr. WALTON: I quite follow what has fallen from your Lordship; but does your Lordship think it desirable that the issue as to the quality of the water should be tried, and then that the question of law should arise afterwards? or would your Lordships adjourn the matter for the pleas to be amended?

Justice WRIGHT: Until the difficulties are cleared away which are caused by the case being argued on demurrer, it is difficult to say what should be done.

Mr. WALTON: I ask that the case may be adjourned, in order that the pleadings may be so drawn that we should know what case we have to meet. My friend says there is a case of negligence.

Mr. FINLAY: I say it is a wrongful act.

Justice WRIGHT: It is said the water from the colliery is not being delivered and used at all.

Mr. WALTON: That is so; it has not been used for months.

Justice WRIGHT: Do you supply other districts?

Mr. WALTON: Tynemouth and North Shields.

Justice WRIGHT: Cannot you distribute the water so as to give this "stuff" to some other districts—say, for cleansing the sewers?

Mr. WALTON: We say there is no foundation for the statement about the water. It is an extremely important question to us; and we should like to have the issues which are to be tried clearly defined.

Justice COLLINS: It is not our function to re-draw the statement of claim.

Justice WRIGHT: Could it be admitted that the Company are within their rights (apart from the question of pollution) in taking water from the watercourse whence they take it, and by the other side—for the purpose of argument only—that the water is polluted by the fault of somebody else?

Mr. FINLAY: No; the facts are really as alleged. My learned friend is right in saying the channel is one formed by a stream of running water; but the only water in the channel is that which is pumped from the bottom of the mine. We say it is not a "stream" within the meaning of the Act. It is really a drain from the mine.

Justice WRIGHT: As at present advised, I do not think we could grant any injunction.

Mr. FINLAY: Your Lordships have not heard me yet.

Justice COLLINS: Here the Water Company, who have certain powers, have chosen to tap a sewer outside their district, and this sewer is in connection with the plaintiffs' cistern. Unless restrained, the Company will continue to send sewage water into the cistern. Why, under these circumstances, should an injunction not be granted?

Mr. WALTON: Because the Court will never grant an injunction where the nuisance can be abated by the plaintiff. He can abate it by ceasing to take the water.

Justice COLLINS: If customers choose to go without water, they can abate the nuisance; but not if they continue to take a supply. You have practically a monopoly.

Justice WRIGHT: We both think we ought not to decide the question upon the present state of the pleadings. Would there be any great expense in trying the facts at Newcastle?

Mr. WALTON: It would be an expensive investigation, as we should have to call scientific evidence as to the quality of the water. We say the water is not impure. If it should turn out that the plaintiffs are not entitled to an injunction, but only to mere nominal damages, there is no substance in the action.

Justice WRIGHT: You ought not to object to the expense if it will enable you to show that the water is pure. It is a serious thing to supply unwholesome water.

Mr. WALTON: It is a serious thing to put us to the expense of showing that the water is pure.

Justice WRIGHT: If you are supplying water pumped from a mine, it is for you to show that you are in the right.

Mr. WALTON: It is not a mine that is being worked, but a disused mine. I ask that the pleadings should be amended.

Justice WRIGHT: I never find it advantageous to force the other side to amend. We think that we cannot decide the question upon the present state of the law, and the case must go to trial, with liberty to either side to amend if they like. Costs to be reserved.

Mr. WALTON asked that the case might stand over till the July Assizes, in order that the parliamentary proceedings might not be interfered with.

Mr. FINLAY objected. He said it was quite true the Company had a Bill before Parliament asking for power to obtain water from the Newcastle Company. But notice had been given to the Town Clerk of Newcastle that this part of the Bill had been withdrawn; so that as the measure now stood it was merely to enable the Company to increase their charges.

Their LORDSHIPS decided that the case must proceed to trial in the ordinary way; all questions of law being left open to be dealt with then.

NEWCASTLE COUNTY COURT.—Feb. 29.

(*Before His Honour Judge* SEYMOUR, *Q.C., and a Jury.*)

Damages against the Newcastle Gas Company on Account of an Explosion.

In this case William Pinkerton, a miner, of Blaydon, claimed £50 from the Newcastle Gas Company on account of damage caused by an explosion of gas.

Mr. STRACHAN appeared for the plaintiff; Mr. GREENWELL for the defendants.

Mr. STRACHAN stated that the explosion took place at plaintiff's house on Nov. 24 last; and he alleged that it was caused by the negligence of defendants' workmen while connecting their main with the pipe on plaintiff's premises, and thus allowing an escape of gas which caused the explosion and damage within half an hour of the men leaving. The real damage done amounted to £95 17s.; but it was reduced to £50 to bring the action in the County Court.

Mr. GREENWELL urged that this was a serious question for the Gas Company. They were, like anybody else would be, sorry for the

consequences of the accident; but the jury were to consider whether they were liable for what had happened. They contended that they were not the responsible persons in the matter; it was the person who put the pipes into the house. He did not mean the actual plumber, but the landlord who employed him. It was the latter who was the person to see that the pipes were in a proper condition. The only ground upon which the jury could find the Company liable in this case for what had happened, was that the Company had been guilty of some breach of duty towards the owner of the house. It was no use their saying that there was negligence, unless they could find, as a matter of fact, what it was that the Company had neglected to do. In this case, there was nothing to show that the Company had done something, or had omitted to do something, in respect of which they could be blamed. The pipes in the house were the property of the landlord, and not of the Gas Company, who were not responsible for anything that was done to either the pipes or the gas inside the house. The Gas Company's workmen did nothing to cause the accident that occurred.

After evidence had been given,

The jury found that defendants were responsible for the pipes up to the meter, and gave a verdict for plaintiff for the £50.

His HONOUR, on the application of Mr. Greenwell, consented to a stay of execution for a month.

Mr. GREENWELL stated that there would probably be an application for a new trial, on the ground that there was not sufficient evidence to go before the jury, and that his Honour ought to have non-suited the plaintiff.

The Thirlmere Water-Works and their Cost.—At last Wednesday's meeting of the Manchester City Council, Mr. Bax called attention to a statement by the Chairman of the Stretford Local Board to the effect that Sir John Harwood had said that the cost of the Thirlmere Water-Works would be £100,000 annually. This was given as a reason against amalgamation with Manchester; and if the statement was true, it would mean a rate of about 9d. in the pound. Alderman Sir J. Harwood said he might explain that it would require, to pay the expenditure upon the Thirlmere water scheme, £106,000 per annum; but this would be met in various ways. In five years they would have £20,000 more income than they now had. They had spent large sums on the Longdendale works, which would not require any repairs for 30 years to come; and with all the economies that they had been effecting, there need not be a single farthing of additional taxation.

The Charges of the Southwark and Vauxhall Water Company.—Last Thursday week a deputation from the Corporation of Richmond waited upon the Directors of the Southwark and Vauxhall Water Company, with a view to obtaining a reduction in the present charge of 1s. per 1000 gallons, for water supplied to the borough by that Company. The deputation was received by Sir Henry Knight, Chairman of the Directors, and the other members of the Board. Alderman Piggott, the Chairman of the Water Supply Committee of the Richmond Corporation, explained the object of the deputation, and pointed out that the Wimbledon Local Board was supplied by the Company at 8½d. per 1000 gallons, and the quantity taken was not so great. Richmond consumed during the last financial year 52,991,000 gallons. When the arrangement was made with the Company that they should charge 1s. per 1000 gallons, it was never contemplated that so much would be required. Mr. Dimbleby next addressed the Directors, and said that all Battersea water was supplied to the Vestry at 8 d. per 1000 gallons. Sir Henry Knight replied that Wimbledon and Battersea were within the parliamentary area of the Company as regards the domestic supply, and the water sold to the Wimbledon Local Board and the Battersea Vestry direct was for road watering; and it was only for road and trade purposes that water was supplied at less than 1s. per 1000 gallons. The Directors, however, would give the matter their careful and friendly consideration.

The Management of the Rotherham Corporation Gas-Works.—The recent decisions of the Rotherham Town Council relative to the management of the gas and water works (see *ante*, p. 263) have led Mr. J. Cox to tender his resignation as Chairman of the Gas Committee. In his opinion, the changes will cause a serious loss to the ratepayers; and he declined to take part in carrying them out. The matter came before the Council last Wednesday, when, in the course of the discussion, Mr. Cox said he could not see how the members could expect him to continue to act as Chairman of the Gas Committee, as it was a very important Committee, and one which embraced more of a commercial aspect than any other. Unless, therefore, the Chairman had the support of the majority of the Committee over which he presided, in his opinion he had no business to presume to take the office; and it was evident he had not the support of the majority. The views which he took with regard to the management of the gas-works were antagonistic to the wishes of the Council. He therefore failed to see how he could do otherwise than he had done. He had every wish to work for the good of the town, and be in peace and harmony with every member of the Corporation; but he would not be Chairman in name only. In the end, the Council referred the subject to the Gas Committee for consideration. Later in the proceedings, another matter connected with the management of the works was discussed by the members. The Council in Committee had recommended that Mr. C. B. Newton, of the Sheffield Gas-Works, should be appointed Gas and Water Engineer. Alderman Neill moved that the question be referred back to the Committee, arguing that from the resignation of the Chairman of the Gas Committee, and other circumstances, considerable feeling on the subject existed among the members of the Corporation. In his opinion it would be wise, in the interests of the gas-works and the amicable working of the Council, to reconsider the question. Mr. Cox seconded the amendment, contending that the Council had been placed in a false position in regard to the appointment. The discussion was a prolonged one, several members taking part in it. On being put to the vote, the amendment was negatived by four votes to sixteen; and the recommendation of the Committee was then passed. A motion, of which notice had been given by Mr. Sorsby—"That gas-meter rents be abolished, and that all consumers of gas and coke be charged one uniform price," was deferred for a month.

MISCELLANEOUS NEWS.

THE BOSTON (U.S.A.) GAS COMPANIES.

We have received from Mr. H. M. Cross, of Rialto Buildings, Boston (U.S.A.), the following communication furnishing what he describes as "Facts about the Boston Gas Companies":—

The Companies operated by the Bay State Gas Company of Delaware are—

	Capital.	Assessed Values.
The Boston Gas Company	$2,500,000 ..	$4,457,200
The Dorchester Company	400,000 ..	298,400
The Roxbury Company.	600,000 ..	633,500
The South Boston Company	440,000 ..	386,300
Bay State Company of Massachusetts .	500,000 ..	631,500
Total	$4,440,000 ..	$ 6,406,900

The Bay State Company of Delaware have issued upon the above properties $7,000,000 of first mortgage 5 per cent. bonds, $3,000,000 of second mortgage 5 per cent. bonds, $2,000,000 of income bonds of 7 per cent., and $5,000,000 of stock at $50 par value; making a total of $17,000,000. Of this amount, the first and second mortgages represent the actual money paid for the properties, at prices far above their real market values, and including commissions and discounts on bonds. The income bonds and stock represent no money paid in, and are, in the language of the stock board, "wind and water" only.

All the territory now occupied by the combined Companies can be served by a new company, with works having a capacity of 10 million cubic feet of gas per day, and at a construction cost of $7,000,000 or less. Gas capitalists desire a charter to construct such works, and will contract to furnish gas of one-third greater candle power and heat value than the gas now supplied by the Addicks Companies, and at a cost not exceeding $1·25 per 1000 cubic feet in all the sections of the city now occupied by the Delaware Companies, or at $1 for gas as is now supplied.

The Delaware Company are actually paying the interest on $12,000,000, and are now earning fully 4 per cent. on the $5,000,000 of stock; and the officers of the Company are quoted as saying that they will soon be earning 7 per cent. on the whole amount of the income bonds and stock. The only way in which income can be earned by a chartered company on $7,000,000 of "watered" stock, is by excessive charges upon the customers of the company. The Boston Gas Company are charging their customers $400,000 per annum, or more than $1000 per day, in excess of what would be needed to pay 10 per cent. on the capital stock. They are doing this by hiring, from the Bay State Company of Massachusetts, their pipes at an annual rental of $100,000; and they are buying from that Company, at $1 per 1000 cubic feet, gas which the Bay State Company make for 35c.

In the published reports for the current year, it appears that the Bay State Company of Massachusetts, with a plant which cost $700,000, earned $450,000 in the year ending June, 1891—that is, the Boston Gas Company are paying out $450,000 a year for the use of facilities which they could own for $700,000. The Boston Gas Company can hire money at 4½ per cent.; and they also have a large amount of real estate which they could sell to provide money to build all the added facilities needed.

The evidence submitted proves beyond question that the Boston Gas Company are taking $1000 per day wrongfully from their patrons, and in a manner which the Legislature will not tolerate.

With regard to the price of gas elsewhere, Mr. Addicks is fighting to get into Wilmington (Del.) with a new company; and he offers to sell gas at 75c. per 1000 cubic feet, in competition with the Wilmington Company, which is selling gas at $1·12 per 1000 feet, and paying 12 per cent. dividends. Gas is sold in Lowell (Mass.) at $1·10; and the Lowell Gas Company pay 12 per cent. dividends. The price of gas depends largely on the quantity consumed per mile of pipe; and the Boston Gas Company are selling more gas per mile of pipe than any other company in the world, and three times as much per mile as in Wilmington or Lowell. Nothing prevents the Boston Gas Company from selling gas at $1 per 1000 cubic feet, except its connection with the Bay State Company. Proceedings to terminate this connection are now pending before the Legislature, on behalf of the gas consumers of Boston.

TOTTENHAM AND EDMONTON GAS COMPANY.

The Half-Yearly Meeting of this Company was held last Saturday week, at the Offices, Willoughby Lane, Tottenham—Mr. CORBET WOODALL in the chair.

The SECRETARY (Mr. James Randall) read the notice convening the meeting; and it was agreed to take as read the Directors' report and the accounts, which were summarized in the JOURNAL for Feb. 23.

The CHAIRMAN said it became his duty to propose the adoption of the report and accounts. But before saying anything to commend the resolution to the shareholders, he had to express, on behalf of the Directors, their sincere regret that the chair was not occupied by their respected Chairman (Mr. George Gripper). Most of those present had been in the habit of attending the half-yearly meetings, and knew the interest Mr. Gripper took in the affairs of the Company; and he was sure they would all join in hoping that he would be able shortly again to occupy the place he so fitly and happily filled. The account of him they received that morning showed he had been very ill, but was now on the way to becoming convalescent. Turning to the report, the Chairman said he was disposed to take the last paragraph in it as the text for the few observations he had to make. He felt that the figures in the accounts were eminently satisfactory, and such as they might very well congratulate themselves upon. As the proprietors were aware, the last two or three years had been a period of considerable trial to gas companies. There had been a large increase in the cost of coal, and also in the item of wages; and against the advance in coal, there had not been a corresponding increase in the amount realized by the

sale of residuals. The elasticity of the residuals market seemed to have failed in the last year or two. The effect of this had been apparent in the case of a great many companies, in the form of depleted reserve funds and an increased price for gas, and in some instances, reduced dividends. Therefore he thought it was a matter of great satisfaction to them all that they had been able to tide over this trying period without either raising the price of gas, reducing the dividend, or taking a penny from the invested reserve fund. This suggested to him the very great desirability of maintaining the reserve fund at a full and satisfactory amount. The advantage of such a fund in steadying the operations of a company—enabling the Directors to pass through periods of trial such as recently experienced with a minimum of inconvenience to the consumers as well as to the shareholders—could hardly be exaggerated. For his own part, he thought a good reserve fund was a better security for the value of their property than was a high dividend; and he trusted therefore that, when good times came, as he believed they would, this Company would not only maintain the fund but would increase it. But, of course, the proprietors were aware that they could only add to the reserve fund by one of two means—either by lowering the price of gas or decreasing the dividend. The Directors, however, were not contemplating a reduction of the dividend, but they were looking forward to a reduction in the price of gas. If they brought down the price, they might pay an increased dividend, or put the money, which such increase represented, into the reserve; and it would be a matter for the serious consideration of the shareholders whether they should not forego the additional dividend and increase the reserve. The Directors had had under their notice a threat of still further trouble in the matter of the coal supply. It was reported that it was the intention of the colliers to take a prolonged rest—to cease from labour, and to terminate for a time the output of coal. But he did not think this would cause the Company any inconvenience or loss, because their stock was fairly good. The object of this action of the miners was doubtless to maintain the excessive price of coal. It did seem to him much to be regretted that any body of men (whether workmen or masters) should be able to derange the whole trade of the country in so selfish and useless a manner. Except the increased cost of coal and the results obtained from residuals, there was not, continued the Chairman, much to call for attention in the accounts. He might say that, since Christmas, 1888, they had only once managed to earn the dividends. Each half year they had had to withdraw sometimes more and sometimes less from the undivided balance. The amount on the three years was £2394; but they had not had to touch the invested reserve fund. The price of coal throughout the past year was 18s. 2d. per ton; and this was an increase of about 2s. 6d. compared with the preceding year. The receipts for the residual products during the year only amounted to 9s. per ton; while in 1890 they received 8s. 11d. Consequently, they had paid 2s. 6d. more for coal; but had only realized 1d. in improved returns from residuals towards that increase—in other words, they had had an additional 2s. 5d. per ton which had had to be made up by savings in other directions. Of course, the great security of the Company was that they had a growing district, and a business that never stopped; and, so long as they had this increasing business, they could safely look in the face these occasional periods of trial. The only way to secure that the business should go on prospering was to follow the course which had characterized the Company in the past, and try to give as thorough and good a supply of gas as possible, and at as low a price as they could afford. There was one other item to which he might be pardoned for referring—the rates and taxes. It was a matter of peculiar and rare satisfaction to be able to congratulate the proprietors upon a reduction in the amount appearing in the revenue account as having been paid for rates and taxes. There was a second side to the question, and it was this—that this item included income-tax, which had been less because the profits were less. It was also a fact, however, that throughout the district generally the rates had gone down; and this seemed to point to an improved state of things in the neighbourhood.

Sir H. CARTWRIGHT, in seconding the motion, said he exceedingly regretted, with Mr. Woodall, the absence from the meeting of their respected Chairman; and he hoped that a short time would reinstate him in health. As to the report, he considered that it was most satisfactory; seeing that they had only to take a little more than £100 from the undivided profits for the purpose of paying the dividend. Referring to the price of gas, he said that many shareholders thought they ought to have increased it; but taking into consideration the joint interests of the consumers and the proprietors, the Board had determined not to raise the price if it could by any means be avoided. He hoped the increased consumption that was going on would enable the Directors to pay the same dividends without trenching further on the undivided balance.

Mr. MOORE called attention to the growing use of oil-lamps in the district for lighting shops; and he asked whether the Company could not compete with oil by supplying gas for business purposes, through a separate meter, at a lower price than for the domestic supply.

Mr. WATSON referred to the satisfactory increase in the number of gas-stoves let out on hire, and to the amount of gas that had been extracted from the coal. During the half year, they had produced 10,500 cubic feet, which he regarded as an extraordinary amount.

The CHAIRMAN, in reply, said the Directors had for a long time past been fully alive to the competition to which they were exposed from oil. They were not afraid of that competition on the ground of efficiency for money spent. But the advantage of the oil was that the consumers were able to purchase it in small quantities, and they hardly noticed the few pence expended from time to time; whereas a quarterly bill for gas appeared to be rather a serious thing. The Directors had made some efforts in the direction of making the collections at shorter intervals, and by the introduction of prepayment meters. Mr. Watson had referred to the number of stoves in use. This was a matter in which the Directors did take a great deal of interest; and they were delighted to find an increase from month to month.

The motion was then carried.

On the proposition of Mr. J. WARREN, seconded by Mr. WALTER LOW, dividends were declared, less income-tax, on the "A" stock at the rate of 11½ per cent. per annum, and on the "B" and "C" stocks at the rate of 8½ per cent.

Mr. ALFRED RICHARDS moved, and Mr. PERKINS seconded, a vote of thanks to the Chairman and Directors; and this having been carried,

A resolution was passed, expressing sympathy with Mr. Gripper in his illness, and hoping that he would be speedily restored to health.

The Rev. W. ALMACK (Mr. Gripper's son-in-law), on behalf of the family, briefly thanked the shareholders for their kind expression of sympathy.

The services of the officials having been fitly acknowledged,

Mr. J. RANDALL and Mr. W. H. H. BROADBERRY thanked the shareholders for their continued confidence in them; and the last-named gentleman gave a few figures regarding the quantity of gas produced and sold. He said that the actual quantity of gas made per ton in the past half year was 10,900 cubic feet, and sold 10,512 feet; but for the entire year, the amount sold stood at 10,002 feet. In 1866 they manufactured 53,324,000 feet; and last year 320,564,000 feet.

The proceedings then terminated.

BRISTOL GAS COMPANY.

The Half-Yearly General Meeting of this Company was held on the 26th ult.—Mr. J. W. S. DIX in the chair.

The SECRETARY (Mr. J. V. Green) having read the notice convening the meeting, the report of the Directors, with the accounts for the six months ending Dec. 31 last, to which reference was made in the JOURNAL a fortnight ago, was taken as read.

The CHAIRMAN, in briefly moving the adoption of the report and accounts, expressed the pleasure of the Directors at being able to present so favourable a statement to the proprietors. During the past half year, a great deal of money had, he said, been spent in repairs; and the works were in an efficient state to earn the dividend, while other companies had not earned theirs, but had drawn upon the reserve fund in order to pay a reduced dividend. This was a subject of congratulation; and he did not propose to add any superfluous remarks.

The DEPUTY-CHAIRMAN (Mr. G. K. Stothert) seconded the motion.

Mr. H. A. MEDWAY referred to certain complaints which had appeared in a local paper concerning the quality and pressure of the Company's gas, and said he would leave the Chairman to explain whether or not there was any justness in them. As to the complaints of inefficient light, he was convinced that a great deal of this was due to the use of bad burners. Then, again, there was the possibility of meters getting out of order and pipes becoming corroded. As far as he was concerned, he was tired of hearing these complaints; and if the shareholders looked to their responsibility in this matter, he thought householders should do their part.

The CHAIRMAN, in reply, said he was glad of the opportunity afforded of referring to the matter. The Company had statutory obligations now to provide gas of 14·50-candle power; but before their recent Act it was 13·50 candles. The Company now supplied gas of a quality far in excess of that which they were obliged to send out. He would, in support of this, take the November returns issued from the official testing office, which, owing to its being in the lowest-situated street in the city, was certainly, from the Company's point of view, the most disadvantageous site for the tests to be made. The daily registers, as issued from that office, for November, showed that the gas ranged in quality from 16·1 to 15·65 candles; and here he would remind both the shareholders and the public that the obligation of the Company was only to provide a light equal to 14·50 candles. Taking February, he found that the Company had sent out gas as high as 16·29 candles, according to the returns from the official testing office, although it was a higher quality than that when it left the works of the Company. The photometer used by Mr. Kitt (the Chief Examiner of gas) was out of order, and he was about to be supplied with a new one. This was a fact which the Company would rejoice at, because his reading of the quality of the gas and theirs differed materially. According to their register, gas had not left the Company's works once in February of less illuminating power than 16·50 candles. It would thus be seen that the Company endeavoured to do all they were obliged to do, and much more; and, instead of so much complaint, he thought they should receive some expression of gratitude from the consumers.

A SHAREHOLDER expressed satisfaction that the leakage was not so great as it had once been. He said he had had experience in the laying of pipes; and seeing how easy it was for the mains to leak, and how difficult for the exact place of the leakage to be ascertained, he would suggest that the main should be protected with a packing of brown lime concrete. This would cost more, it was true; but it was of great importance that the Company should protect their pipes in the best possible manner.

The CHAIRMAN thanked the proprietor for his practical suggestion. At the same time, he said he was glad to announce that the loss of gas showed a decrease of 2 per cent.

The MAYOR (Dr. Highett), who is a Director of the Company, added a few remarks to enforce the advisability of consumers looking to their pipes and burners, the reward of which would, he said, be a better light.

The motion was then put, and carried unanimously.

The retiring Directors having been re-elected, Mr. F. N. Tribe was appointed an Auditor in place of his father, Mr. W. Tribe, who relinquished the duties.

The half-yearly dividend, at the rate of 5 per cent., was next declared; and the business of the ordinary meeting concluded.

A special meeting was then held, at which the Directors were authorized to proceed with the Bill now being promoted by the Company to enable them to extend their works.

The proceedings closed with a vote of thanks to the Chairman and Directors.

The Campbell Gas-Engine Company, of Halifax, have just opened a branch show-room at No. 103 Snow Hill, Birmingham; the new premises being lit by electric light driven by means of a 4-horse power Campbell gas-engine. The branch will be under the management of Messrs. A. and G. Bentley.

PROVINCIAL GAS AND WATER COMPANIES.

From the financial statements and reports of meetings of the various Provincial Gas and Water Companies mentioned, we have taken the particulars contained in the following paragraphs.

Gas Companies.

The net profit at the disposal of the Abingdon Gas Company for the six months ending Dec. 31 last was £1350; and at the meeting of shareholders last Thursday, the Directors recommended that £500 of this sum should be employed in reducing the temporary loans, and that dividends at the rates of 5s. per share on the original shares, and 3s. 6d. per share on the "B" shares, should be declared. This would absorb £345, and leave a balance of £505 to be carried forward. The total receipts were £2405; and the expenses, £1493—leaving a profit of £912. This, added to £613 unappropriated from the previous half year, made up £1525, of which £174 was used in payment of interest on the temporary loans and on bonds.

The tenth half-yearly meeting of the Barry Gas and Water Company has been held. It was reported by the Directors that, owing to the continued increase in the business, it had been found necessary to apply to Parliament for powers to realize further capital to extend the works. The balance-sheet showed an allowance of £2201 from the revenue account for interest on the debenture stock; the balance available for dividend on the ordinary shares being £1880. The expenditure had been £2785 and the receipts £4885. The Directors recommended a dividend at the rate of 5 per cent. per annum on the various stocks. The Chairman (Mr. T. Webb), in moving the adoption of the report, said that the revenue from gas and water was constantly advancing. It had increased from £2748 a year ago to £4693. They had now about 25 miles of pipes, and from £8000 to £10,000 worth of mains which were not yet productive, but every week they were getting more so on account of the increase in houses. The report was adopted.

In moving the adoption of the report and balance-sheet at the meeting of the Castleford and Whitwood Gas Company last Wednesday week, the Chairman (Mr. J. Watson) stated that extensions had been made in the retort-house, including three stacks of seven retorts each, which would largely increase the producing power. The sale of gas had advanced from 15,250,000 feet in the corresponding half of 1890 to 17,038,700 feet in the past six months. The total receipts amounted to £3415; and the balance available for distribution was £1260. Out of this the Directors recommended a dividend at the rate of 9 per cent. per annum, and that £100 be placed to the reserve fund, which would then stand at £500. The motion was adopted; and the dividend recommended declared.

The report adopted at the half-yearly meeting of the Douglas Gas Company on Monday of last week showed net profits amounting to £3496—an improvement as compared with the corresponding period of 1890. Including the balance brought forward, there was available for dividend £5044, out of which the Directors recommended a dividend of 35s. per share.

According to the remarks made by the Chairman (Mr. H. Rollinson) at the recent meeting of the East Ardsley Gas Company, during the past six months the quantity of gas produced was 5,344,000 cubic feet, as against 4,735,000 feet in the corresponding period of 1890; and the Directors were able to pay a dividend of 5 per cent., and carry forward a small balance. Anticipating an increased demand for gas next winter, he stated that the Board had decided to erect a new gasholder for storing from 45,000 to 50,000 cubic feet. The holder would be a two-lift one, and capable of containing from 90,000 to 100,000 cubic feet of gas. The contract for the tank had been let to Mr. Walter Binns, of Bradford, for £750, and the holder would be made by Messrs. W. C. Holmes and Co., of Huddersfield, for £990. The holder would be 62 feet in diameter and 16 feet deep. The report was adopted.

At the recent half-yearly meeting of the Eastbourne Gas Company, the report submitted by the Directors stated that the revenue account showed a profit for the half year of £5550, which, added to £6983 the balance brought forward after payment of a dividend in August last, would give a total sum of £12,534 available for dividends. The Directors, therefore, recommended that dividends for the past half year be declared at the rate of 13 per cent. per annum upon the £20,000 original capital of the Company, and also upon the £12,490 (the amount raised on the "C" shares), and at the rate of 10 per cent. per annum upon the £55,000 paid-up capital raised on the "B" shares, which would absorb the sum of £4861, and leave a balance of £7672 to be carried forward to the next account. The report was adopted.

The report presented at the 91st half-yearly meeting of the Harrogate Gas Company (the principal features in which were noticed in the JOURNAL last week) was adopted by the shareholders at their assembly on the 26th ult. In the course of the remarks made by the Chairman (Mr. C. Allanson) on the occasion, he reviewed very lucidly the report and accounts and said he ventured to think the present position of the undertaking might be regarded as highly satisfactory; much credit being due to the officers recently appointed, and to everyone in the employ of the Company. He thought the flourishing condition of the gas-stove department would be best exemplified by his remarking that 25 per cent. of the total quantity of gas registered by meters was used by cookers, heating-stoves, and engines. The proprietors would be interested to know that the weekly cash payment system had been adopted, under which the working man or the small householder could pay weekly for the gas he consumed. The patent for this had been worked out by Mr. W. Deighton, the Company's Foreman, and Mr. T. Wright, of Leeds. The Chairman afterwards referred to the necessity for raising additional capital, and explained that it was the desire of the Directors to offer the new shares in such amounts as to form an attractive investment for their gas consumers. This co-operative scheme, it was stated, had been introduced with marked success by the South Metropolitan Gas Company; and the Directors believed it would prove equally successful and beneficial at Harrogate. At the close of the Chairman's remarks, the statutory dividends were declared, and the proceedings closed with a vote of thanks to the Directors for their services during the past year.

The half-yearly meeting of the Hastings and St. Leonards Gas Company was held last Thursday. The Directors reported that the increase in the business mentioned in the two previous reports had been well maintained. The quantity of gas manufactured during the year was nearly 24 million cubic feet in excess of the previous year, or 8 per cent. The accounts showed a profit of £12,071, which, with the balance brought forward from the preceding half year, made a sum of £37,433 to be dealt with by the shareholders; and it was proposed to pay a dividend at the rate of 12 per cent. per annum on the £25 shares, and a dividend at the rate of 9 per cent. on the £20 shares. With regard to the manufacturing operations (which are under the charge of Mr. C. E. Botley, Assoc. M. Inst. C.E.), the quantity of common coal carbonized was 16,066 tons, and of cannel 187 tons, from which was produced 165,933,000 cubic feet of gas. The residuals made were: Coke, 10,033 tons; breeze, 672 tons; tar, 156,219 gallons; and ammoniacal liquor, 342,351 gallons. In moving the adoption of the report and the statement of accounts, the Chairman (Mr. J. Brown, J.P.) said he considered the past half year was one of the most successful he had known. Considering the great depression the town had passed through, and that there were very few gas companies who nowadays could hold their own, he thought the report was highly satisfactory. It might be asked what was the cause of their prosperity. There were several things which favoured them. The first was the very large increase of their trade, which had gone up by leaps and bounds. Electricity did not seem to affect it at all—indeed, the more electricity was introduced, the more trade they did. The second reason was the considerable care bestowed upon details by the Directors and officials—a matter on which a great deal of their profit depended. He would mention one case to show what was done—viz., in purifying the gas. In 1886, this cost £429, and the coal carbonized amounted to 12,680 tons, at a cost of 9·86d. per ton; while in 1891 purifying cost £326, the quantity of coal carbonized was 16,254 tons, at a cost of 4·68d. per ton. The third cause of prosperity was their position with regard to finance. They had a reserve fund, or undivided profits, of £30,000; and, in addition, there was an item of £20,000 premiums on the sale of shares, on which sums they paid no interest at all. Adverting to residuals, he said that coke was now a drug in the market all over the country; but they had received more from them than in any corresponding half year, though they had not obtained such a good price for it as they ought to have done. The sensational part of their trade was in ammoniacal liquor. In 1886 they received from its sale £21, and one half year nothing at all; but in 1891 they realized £1425. Mr. G. W. Veness seconded the motion, which was agreed to.

The annual meeting of the Ilfracombe Gas Company was held on Wednesday last. The report (which was adopted) showed that there had been a good average increase of business. The balance standing to the credit of profit and loss account and available for dividend was £1224, out of which the Directors recommended the payment of the usual dividends of 10 per cent. on the "A" shares, 7 per cent. on the "B" shares, 4 per cent. on the "C" shares, and 2½ per cent. towards the arrears of dividend on the "A" shares—leaving only 3½ per cent. due. The make of gas, it was also stated, had increased by 2,053,000 cubic feet.

At the recent annual general meeting of the Longwood Gas Company, the Chairman (Mr. E. Armitage, J.P.), in moving the adoption of the report and accounts, stated that, owing to the difficulties the Directors had encountered during the past year, and having to contend with a falling off in sales, an advance in wages, and the high price of coals, he was unable to congratulate the shareholders upon a very high result. At the same time, he was pleased to be in a position to state that, by the improvements adopted in the works, and by strict economy in their management, they were able to reduce the unaccounted-for gas; and they hoped to show something better another year. The Vice-Chairman (Mr. R. Thornton) seconded the motion, and it was carried. Subsequently, in acknowledging a vote of thanks, the Chairman expressed the satisfaction of the Directors at the way in which the Manager and Secretary (Mr. J. L. Mitton) discharged his duties—adding that the Board had full confidence in him.

Last Tuesday, the annual meeting of the Rugby Gas Company was held. From the report it appeared that the receipts on revenue account for the year ended Dec. 31 last amounted to £12,236, and the expenditure to £8901; leaving £3335 to be carried to the profit and loss account. The net balance was £4864; and the Directors recommended the payment of a dividend for the past six months at the rate of 11 per cent. per annum on the paid-up share capital. The report was adopted.

The annual meeting of the Sevenoaks Gas Company was held last Thursday week. From the report and accounts which were submitted, we learn that the gross receipts for the half year were £5393, and the gross expenditure £3719. The profit amounted to £1674; and the sum available for dividend was £2578. The Directors recommended the usual appropriation—viz., 10 per cent. (less income-tax) on the original capital, and 7 per cent. on the additional capital. As to the operations at the works, during the six months 3229 tons of coal were received, of which 2498 tons were carbonized and used; and the following residual products were made: 2498 chaldrons of coke, 240 chaldrons of breeze, 25,303 galions of tar, 37,470 gallons of ammoniacal liquor, and 24 tons of sulphate of ammonia. The report was unanimously adopted.

The annual meeting of the South Bank and Normanby Gas Company was held last Thursday week. The report of the Directors showed that the receipts on revenue account, with the balance from the previous year's accounts, amounted to £6594, and the expenditure to £3562, which left a balance of £3032. An interim dividend of 4 per cent. was paid in August last, and a further dividend of 5 per cent. was recommended. The report was approved.

Water Companies.

The ninth half-yearly meeting of the East Warwickshire Water Company was held at Nuneaton last Saturday week. The report of the Directors stated that the number of houses now connected with the Company's mains was 1240, as compared with 1140 in August last. The financial statement showed that the half-year's working had resulted in a profit of £227; and of this sum £192 had been paid away as interest on the debenture bonds. In moving the adoption of the report and accounts, the Chairman (Mr. H. Townshend) referred to the difficulties which had been met in boring for an increased supply, and stated that, in view of the great progress of the town—progress which the Company

never anticipated to such a degree—a further supply was absolutely necessary. The report was agreed to.

The report and accounts of the Maidstone Water Company, which were submitted at the half-yearly meeting on the 25th ult., showed that the water-rents had amounted to the sum of £4228, and the profit to £1997; making the sum of £5378 to the credit of the profit and loss account. The Directors recommended the payment of a dividend (free of income-tax) for the half year of 4½ per cent. on the 10 per cent. shares, and of 3½ per cent. on the 7 per cent. shares. These payments would absorb the sum of £1957, and make the dividend for the year on the 10 per cent. shares 8¾ per cent., and on the 7 per cent. shares 6¼ per cent. The Directors stated that they found it necessary that the powers of the Company to build a pumping-station at the Forstal, Aylesford, to pump the Cossington water (which at present was only used by gravitation) into the two higher services, should at once be utilized; and they had entered into contracts amounting to £5367 for the erection of the necessary engine-house, boiler-house, engine, and pump. The Directors also mentioned that they had received a further communication from the Maidstone Urban Sanitary Authority, which would be laid before the shareholders; but they did not see their way to advise them to part with their property at the present time. The Chairman (Mr. C. Ellis), in moving the adoption of the report, said he thought it was satisfactory—he was going to say exceedingly satisfactory—because it showed that the Company was gradually progressing, and that during the past year they had been able to increase the dividend by 10s. on the 10 per cent. shares, and 7s. 6d. on the 7 per cent. shares; and, speaking for the Directors, he believed he might say that they saw no reason why they should not be able to continue increasing the dividend. Proceeding, he said the Directors had received a further communication from the Urban Sanitary Authority; but they did not advise the shareholders to part with their property at the present time. He thought it likely that the shareholders would not feel inclined to dispose of the concern unless they obtained a very considerable price for it. The sum offered for the undertaking was £130,000. The matter was now in the hands of the shareholders; and it was for them to decide whether or not they would recommend the Directors to make an arrangement to part with the property. Major Haynes seconded the motion. After a short discussion, the letter which had been received from the Urban Sanitary Authority was produced; and the following resolution which it contained was read: "That the Directors of the Water Company be requested to bring the question of the purchase of the undertaking by this Authority before the shareholders, as it is thought desirable that the supply of water to the town should be under the control of the Local Authority, and to ascertain if the Directors and shareholders are willing to sell at a fair and proper price, and in such case to suggest that such price should be arrived at by arbitration or agreement." Mr. Day then moved that the letter from the Local Board having been read, and the resolution of the Directors considered, the shareholders decline to accept the invitation of the Local Board. He remarked that if the Board wished to buy the concern, the Company were perfectly competent to put a price upon it without going to arbitration. This motion having been seconded, Mr. Cox—feeling that this and similar undertakings should belong to the people, and be managed by their representatives—proposed an amendment, to the effect that the shareholders were willing to sell the property at a fair price. The amendment was not seconded, and Mr. Day's resolution was carried, as well as the report of the Directors. An extraordinary meeting was then held, at which the Directors were empowered to raise the sum of £5000, part of the capital authorized to be raised by the Company's Act of 1885, by the issue of mortgages and ordinary shares of the value of £10 each.

The annual meeting of the Newcastle and Gateshead Water Company was held yesterday week. The Chairman (Colonel Potter, C.B.), in moving the adoption of the report—which was noticed in the JOURNAL for the 23rd ult.—said he thought every shareholder would be satisfied with the balance-sheet, which showed that the Company were in a prosperous condition. During the past year, they had spent upwards of £74,000 on capital account. They had completed the high service at Gateshead, and had constructed at Beacon Lough an extra reservoir, holding about 250,000 gallons of water, at a height of 550 feet above the level of the sea. The Company were laying a new 20-inch main from a second point at Gateshead; so that they might be enabled to supply the people of the sister borough with a better supply of water at a greater pressure. In Newcastle they had completed a 30-inch line of pipes from Newburn to the foot of Rye Hill; and it was temporarily connected at Newburn with the pipe from the filter-bed at Throckley. From the foot of Rye Hill, they were carrying a 24-inch pipe through several important streets; so that in a very short time they would be able to give a very much larger supply to Newcastle. They were also busy laying a pipe from Newburn to Whittle Dene. When this and the filter-beds were completed, they would have an extra supply through a 30-inch main laid to Newcastle; and they hoped in the course of time to be in a position to supply the city with as much filtered water as the inhabitants might require. The quantity of water used averaged 100 million gallons a week; and the Company had in store sufficient to last for thirty weeks. The Redewater works would be completed possibly the year after next. Mr. W. B. Wilkinson seconded the motion, and it was agreed to. Dividends for the half year ended Feb. 1 were then declared on the original consolidated stock at the rate of 10 per cent. per annum, making, with the interim dividend paid in August last, 9 per cent. for the year; on the stock under the Act of 1876, at the rate of 7 per cent. per annum, making, with that paid in August last, £6 6s. per cent. per annum; and on the preference stock, at the rate of 5 per cent. per annum. A special meeting was afterwards held, when resolutions were passed empowering the Directors to raise, as required, the sums of £125,000 and £30,000 authorized to be raised on mortgage under section 29 of the Company's Act of 1889, and section 25 of their Act of 1890, and consenting to the money being issued in the form of debenture stock, on which a dividend of 4 per cent. will be paid.

According to the report presented at the half-yearly meeting of the Sevenoaks Water Company on the 21st ult., the balance at the credit of the profit and loss account was £1200, out of which sum the Directors proposed the payment of a dividend at the rate of 8 per cent. per annum on the consolidated stock and £5 12s. per cent. on the share capital, free of income-tax. In moving the adoption of the report, the Chairman (Mr. W. H. Cronk), stated that, though there was a slight falling off in the revenue from water-rents, they had earned a substantial sum by the sale of stone taken out of the Company's lands, and they had effected certain savings in various items of expenditure. He also referred to the application which the Company are making to the Board of Trade for power to increase the capital by £12,000, which, he said, would bring the nominal capital up to £40,000, and would save the expense of another application to the Board of Trade a few years hence. The power they sought had met with opposition from the Board of Guardians and the Local Board; but he thought both bodies had been badly advised in taking this step, and that unnecessary legal expenses would be incurred on both sides. For his own part, he had no doubt that what they asked for would be granted in its entirety, as it was just and reasonable. The report was adopted; and among other subsequent business, the Directors' fees were increased to £157 10s.

The ordinary general meeting of the South Essex Water Company was held on the 27th ult.—Mr. W. C. Fooks in the chair. In moving the adoption of the report, the Chairman congratulated the shareholders on the satisfactory position of the Company. They were, he said, paying an increased dividend, in addition to writing off a large sum for depreciation. The concern was now in a sound financial position; the works were in capital order; and everything was progressing favourably. He believed they were within measurable distance of paying a 4 per cent. dividend. The Directors would not require any more capital to complete the works in hand until the beginning of next year, when he hoped the shareholders would respond liberally. The motion was carried.

DARLINGTON CORPORATION GAS SUPPLY.

The Quality of the Gas—The Dinsmore Process.

On the minutes of the Gas Committee coming before the Darlington Town Council last Thursday, Mr. Drury referred to the quality of the gas supplied in the borough. This, he said, was not so good as it used to be; and he thought it was a great mistake to reduce the pressure to the extent it was now done during the day. The consumers who had gas-stoves were almost unanimous in complaining that there was not pressure enough to enable them to use them; and he considered it was very unfair not to give them a sufficient supply. Then, again, a short time since the Dinsmore process was introduced at the works, at a cost it was reported of something like £1000, which was practically a dead loss. He saw from the minutes that they were going to introduce some fresh Dinsmore plant, which would seem to point to the fact that the first was not satisfactory. The Mayor (Alderman Walker) said that, as to the alleged poverty of the gas, he thought the Gas Manager would support him in saying that the average illuminating power was 16¼ candles. The day pressure question was a very serious one. If they gave through the day a pressure equal to that at night when all the lamps were lighted, they would increase the leakage possibly 5, 7, or even 15 per cent.; and clearly any profit hitherto derived from those who wished to cook by gas would be lost in that case. As to the Dinsmore process, some little time ago they had the matter before them, with the result that they came to the conclusion that there was something in it; and, under certain conditions, they agreed to allow the Dinsmore Company to make an experiment at the works, but not at the ratepayers' expense. Certain plant was put up at a cost not of £1000, but about £500; and since then sanction had been given to the Committee to erect plant necessary for an experiment at their own cost. The Committee believed that, when this new plant was tried, the result would be that they would get a largely increased illuminating power without the use of cannel coal at all, and with very common coal, which would cost some shillings per ton less than they were now paying. If it succeeded, it would mean a saving of a large amount each year to the Corporation; and if it failed, they would lose very little indeed. The minutes were then adopted.

Extension of Electric Lighting at Blackpool.—The Electric Lighting Committee of the Blackpool Town Council have decided to recommend the Council to considerably extend the lighting of the Promenade by electricity. It is also intended to light a few of the principal thoroughfares, and supply places of business desiring the light.

Strike at Messrs. Richmond and Co.'s Gas-Stove Works.—Owing to a dispute which arose about a fortnight ago, at the gas-stove works of Messrs. Richmond and Co., Limited, of Warrington, as to the employment of Union and non-Union men, the whole of the unionist fitters threw up their work. Although this proceeding caused temporary inconvenience, the vacant places were soon filled; and work is now going on practically as usual—the firm having gained a complete victory. The strikers appealed to the local Trades Council for support; and an interview took place between representatives of this body and the Directors of the Company, at which it was proposed, as a termination of all differences, that the disaffected hands should be allowed to resume their duties. As, however, the works were full of men who had taken the place of the strikers, and as the proposal meant the dismissal of the new hands, some of whom had left other situations or come from long distances, the Directors declined it. They felt themselves to be under an obligation to the new men who wished to remain at their work, and who had had promises made to them of certain and constant employment to keep them in their places. A further proposal to the Directors that the differences should be referred to the Mayor or some other gentleman of position was also declined on the same ground. Proof of the good feeling of the Directors towards unionists as a whole was still, they maintained, testified by their retention of men of the Tinplate Workers' Union then on the works, and who wished to remain there. During the height of the strike, one of the discontented hands assaulted a cripple boy in the Company's employ, for which he subsequently had to pay a fine of £5 and costs.

THE SMETHWICK GAS UNDERTAKING.

The report and statement of accounts of the above undertaking for the twelve months ended Dec. 31, 1891, have lately been issued by the Secretary (Mr. W. J. Sturges). They show that the result of the year's work was a net profit of £192. However disappointing this result might be, it was not surprising when it was remembered that the enormous increase in the cost of coal and labour during the past two years had been met without making any addition to the prices charged to the consumers. The sale of gas continued steadily to increase; the improvement in this respect being 4,366,100 cubic feet, or 3·1 per cent. The total revenue from this source, after allowing for discounts, &c., amounted to £19,098—an increase of £639 as compared with the previous year. The receipts from coke and breeze amounted to £6053—a reduction of £288 compared with 1890, and due to diminished value. Prices were well maintained during the earlier months of the year; but a considerable decline took place later on—large quantities of outside coke being introduced into the Midland markets by dealers from gas-works at a distance, where the local demand was poor. Tar showed an improvement of £770; while on ammoniacal liquor a diminution of £122 had taken place, owing to the continued depression of the sulphate of ammonia market. The total receipts from all sources amounted to £26,852, against £26,498 in 1890—an increase of £354. On the expenditure side of the revenue account was found the cause of the serious reduction in the net profit. The expenses showed an advance of £2170 as compared with the year 1890. The cost of the manufacture of gas had risen to £16,025, from £14,319; being an increase of £1705. Of this increase, coal was responsible for £1518; the coal carbonized during the year having cost 13s. per ton, against 11s. in 1890, and 9s. in 1889. The repairs and maintenance of works cost £1472, against £1332 in the previous year. The rates and taxes showed a considerable increase; being £995, as compared with £801 for 1890—the rateable value of the works and mains having been increased by the Assessment Committee. The total increase in expenditure was £2170, against which there was only £353 of additional income; thereby reducing the gross profit for the year by £1817—the amount of gross profit being £7764. The amount provided for interest and redemption was £7572, which being deducted from the gross profits, left the net profit for the year £192. The total loans outstanding on Dec. 31, 1891, were £156,202, and £5887 had been repaid, which made up the amount sanctioned to be borrowed—viz., £162,089; the total amount authorized by their Act of Parliament and Provisional Order being £182,709. Appended to the report was a comparative analysis of the accounts and working results for the years 1890 and 1891. It shows that the gross cost of gas per ton of coal carbonized was 24s. 8·5d. last year, and 22s. 6·8d. in 1890; and per 1000 cubic feet of gas sold, 2s. 7·4d. and 2s. 4·7d. The net cost of gas in the two years was: Per ton of coal carbonized, 14s. 8·0d. and 11s. 10·1d.; per 1000 cubic feet of gas sold, 1s. 6·7d. and 1s. 3·1d. The net profit was: Per ton of coal carbonized, 2·99d. and 2s. 6·71d.; per 1000 cubic feet of gas sold, 0·31 and 3·26d. Last year 15,448 tons of coal were carbonized, which yielded at the rate of 10,001 cubic feet of gas per ton, as compared with 14,989 tons and 9928 cubic feet per ton in 1890. The residuals produced per ton of coal last year were: Coke and breeze, 12·59 cwt.; tar, 11·47 gallons; ammoniacal liquor, 34·74 gallons—the last two figures being a slight advance on 1890.

THE OPPOSITION TO THE SWINTON LOCAL BOARD GAS BILL.

A well-attended meeting of ratepayers convened by the Chairman of the Barton and Eccles, Winton, and Monton Local Board, was held last Friday week, to consider a resolution declaring that it was expedient, in the interests of the ratepayers in the district, that the Bill promoted by the Swinton and Pendlebury Local Board in the present session of Parliament, for authorizing them to purchase a portion of the gas undertaking of the Corporation of Salford, to construct gas-works, and to supply their district and other districts with gas, should be opposed. Mr. W. D. Kendall, the Chairman of the Board, moved the resolution; and then Mr. J. Ashton inquired whether, in the event of the Swinton Local Board inserting in their Bill the clauses suggested by the Eccles Board, the latter proposed to withdraw their opposition. The ratepayers intended to give an unconditional opposition to Swinton supplying Eccles with gas, whatever the Board might do. The Chairman said the resolution before the meeting, which was a broad one, was for opposition; and if it was passed, it was sufficient to cover everything. Mr. Davy, as Chairman of the Gas Opposition Committee, stated that he represented more than 3000 ratepayers who would not have this gas scheme suggested by the Board. The truth was they were in a muddle; and the muddle had arisen in consequence of the clauses to which Mr. Ashton had referred. They would find, he thought, that, if they took a proper course about a differential rate, Salford would supply them with gas at a less price than they could get it at by supplying themselves. Mr. Burgess, another ratepayer, said the Eccles people had during recent years had a reduction of 11d. in the price of the gas supplied by Salford; and it seemed to him that, if they approached Salford in a proper manner, they would obtain a further reduction of 4d. After about two hours' discussion, the resolution was carried, on the understanding that the Local Board should offer an uncompromising opposition to Swinton supplying Eccles with gas. The Board afterwards met to consider their position.

Last Tuesday, the Local Board withdrew their original petition for clauses to be inserted in the Swinton Bill safeguarding their interests. In addition to the opposition which will now be offered by them, the Barton Rural Sanitary Authority, the Little Hulton Local Board, and the Salford Corporation will oppose the Bill. Messrs. A. Knowles and Sons, colliery proprietors, and Captain Dauntesey, of Agecroft Hall, Pendlebury, have also petitioned to safeguard their interests. Mr. Bidder, Q.C., has been retained by the Swinton Board in support of the Bill; and the witnesses who will be called include Sir Frederick Bramwell, Mr. George Livesey, and Mr. Corbet Woodall.

THE BIDEFORD GAS COMPANY'S PROVISIONAL ORDER.

Board of Trade Inquiry.

On behalf of the Board of Trade, Major MARINDIN, R.E., held an inquiry recently into the application of the Bideford Gas Company, Limited, for a Provisional Order.

Mr. J. A. THORNE appeared in support of the application; Mr. TEMPLE COOKE opposed on behalf of the Bideford and Northam Local Authorities.

Mr. THORNE first traced the career of the Company from the formation to the year 1870, when they resolved themselves into a limited liability Company, and applied for a Provisional Order so that they might extend the works. They were opposed then, as now, on the ground that the Town Council contemplated applying for an Order on their own account, and intended to build new works. The Company, therefore, withdrew their application. Their present share capital, which had been increasing gradually, was £6150; but the shareholders had from time to time devoted large portions of their profits to improving the works. They had now reached a point when they could go on no longer without extensive additions and improvements. He (Mr. Thorne) questioned the right of the Local Board to consent or dissent to the application, as the Company did not seek to construct new works within the district of the Authority. As to the objection of the Northam Local Board, he pointed out as significant that neither the Westward Ho nor the Appledore Gas Company had entered any opposition to the application. He had some doubts as to the sincerity of the town to purchase the gas-works, and supposing they did wish to do so, their financial resources were not sufficiently large. He attributed the breakage of sewers complained of not to defect v mains, for they had all been renewed within the last 21 years, but to the passing of a heavy steam-roller through the streets.

Mr. *W. D. Joce*, the Secretary of the Company, was the first witness called. He said that since 1882 the production of gas had increased from 11,148,000 to 20,178,000 cubic feet, or about 80 per cent. An extension of the plant was absolutely necessary. There had been no complaints of any importance during a period of about twenty years; and for the past ten years the Company had paid a 10 per cent. dividend.

In cross-examination, witness admitted that the Company lost on the sale of gas to large consumers, who received 42½ per cent. discount. He denied that he had received any complaints of importance as to the public lighting for some time. The contract price for lighting the town lamps was £2 13s. 10d. for 4-feet burners, and £3 2s. 6d. for 5-feet burners.

Mr. *F. Fulford*, the Company's Manager, said he had been in their employ for 20 years. The daily consumption of gas was about 80,000 cubic feet, which closely equalled their output. The gas mains and pipes were in good condition, almost all having been relaid during the time he had been Manager.

Mr. *Arthur F. Phillips*, M. Inst. C.E., considered the works were very well situated, and in fairly good condition, but not of modern stamp. The daily output could not be increased except at the greatest risk. For even present requirements, it was absolutely necessary that alterations and extensions should be immediately carried out; and looking at the probable increase of consumption, he had advised the Company to expend £5000 in this way. Then the capacity would be increased to a daily output of from 175,000 cubic feet to 180,000 feet. The capital of the Company had been administered with great wisdom. The price charged for gas was exceedingly low; in fact, he did not know that there was any town with a corresponding consumption where gas was so cheap.

Mr. *G. W. Vincent* said his firm consumed nearly 2½ million cubic feet of gas for motive power and heating, mostly in the day time; and unless he received the 42½ per cent. discount, he should utilize Dowson's gas plant.

Mr. COOKE, in opening the case for the opponents, said if the largest gas consumer were prepared to manufacture their own gas if the 42½ per cent. discount was withdrawn, the proposed alterations in the works advocated by the promoters seemed almost, if not entirely, unnecessary. The objection of the Northam Local Board ought to have considerable weight; and in addition, the general body of ratepayers were against the Order. As to the public lighting, the light had been bad; and the price had been increased from £2 5s. to £2 13s. 10d. per lamp. The principal objection, however, related to the injury of the roads by the laying of gas-mains. The Bideford Town Council felt the time had come when they should have the management of the gas-works. It was perfectly true that a proposal of the same kind was made twenty years ago, and that it came to nothing; but the body was composed of a different set of men then. The Council were willing and most anxious, if terms could be arranged, to buy the Gas Company's works. In view of the possibility of this being done, he suggested that the Inspector, if satisfied with the *bona fides* of the Council, should recommend the suspension of the present application for twelve months. If at the expiration of that time terms had not been agreed upon, it would then be a question whether the Order should be granted.

The *Mayor* (Mr. R. Dymond) said the Council desired to purchase the gas-works because the profits would ease the local rates as the profits from the water-works had done. They intended to pay for the concern with money which could be borrowed at a rate of interest not higher than 3½ per cent.

After a short discussion between Counsel, the Inspector said it seemed to him the Company were prepared to sell, and the town wanted to buy.

Mr. COOKE declared his readiness to settle the matter; but Mr. THORNE said he had no instructions to do so.

Mr. THORNE then summed up on behalf of the Company, commenting on the fact that, although the opponents had a Gas Engineer from Exeter (Mr. Willey) present, they had not called him.

The inquiry ended with an understanding that Major Marindin would withhold his report for a month. Meanwhile the town authorities would endeavour to arrange some definite basis of valuation with the Company.

AN ELECTRIC LIGHTING INSTALLATION FOR SALFORD.

At the Monthly Meeting of the Salford Town Council last Wednesday, the members were asked by Mr. Phillips to concur in a resolution of the Gas Committee, that it was expedient the Corporation should exercise the powers conferred upon them by their Electric Lighting Provisional Order. Mr. Phillips pointed out that, unless they took advantage, by Aug. 4, of the Order, any company that had the power could enter the borough and break up the streets, and retain possession for 42 years, at the end of which time the Corporation might find it necessary to buy them out at considerable expense. The Committee did not at present submit any scheme. They were sending out circulars to see where the electric light was wanted; and when they had obtained this information, and had fully considered the matter, they would submit a scheme, but it would only be a very small installation to begin with—sufficient to secure the right to retain the electric lighting in their own hands. The supply would be extended as occasion seemed to render necessary. In the meantime all that was wanted was that the Council should express an opinion as to the expediency of the Corporation exercising their powers. Mr. Roper seconded the motion, and Alderman M'Kerrow supported it. Mr. Mansfield then moved, as an amendment, that it was expedient that the Corporation should for the present postpone the exercise of their powers. He reminded the members that the electric light was at present exceedingly expensive; and that, charging 8d. per unit, as they proposed to do in Salford, it would be about three times the price of gas, which would make it quite prohibitive to any except the wealthy classes. He did not think the latter should be supplied at the expense of the general body of the ratepayers; and he believed the Sub-Committee was unanimously of opinion that a serious loss would result. What right, he asked, had the ratepayers of the borough to be called upon to provide the electric light for 180 gentlemen or advertising shopkeepers, as was done at Bradford? [A Member: Bradford is not making a loss.] He questioned that. In any case, it must be remembered that Salford was not a self-contained place like Bradford or Manchester, and had not many of those hotels, places of amusement, and other establishments such as were likely to take the electric light. Mr. Malkin seconded the amendment. In replying on the discussion, Mr. Phillips, whilst admitting that a profit would not be made out of electric lighting at present, predicted that the light would eventually pay. The cost of a small installation would probably be from £10,000 to £15,000; and he thought they had better run the risk of losing a little at the commencement, than have to pay a large sum to buy out a private company at the end of 42 years. On a division the amendment was rejected, only seven voting for it; and the motion was carried by a large majority.

The Law Relating to Water Companies.—A petition has been presented to the House of Commons from Fulham, praying for an alteration in the law relating to water companies.

Reductions in Price.—The Directors of the Stourbridge Gas Company announce a further reduction in the price of gas from 2s. 10d. to 2s. 8d. per 1000 cubic feet to consumers of under 100,000 cubic feet, and from 2s. 8d. to 2s. 6d. to consumers over the above quantity.—The Haslingden Union Gas Company have reduced the price of gas from 3s. 9d. to 3s. 7d. per 1000 cubic feet for small consumers, and to 3s. 4d. for large consumers.

The Gas Supply of Mexborough and Swinton.—A movement is on foot for the purchase of the Mexborough and Swinton Gas Company's works. The Company was established 36 years ago, with a capital of £28,000; and the present price of gas is 3s. 6d. per 1000 feet. The proposal as to purchase is made by the Chairman of the Swinton Local Board, who advocates the co-operation of the Local Board in the adjoining parish of Mexborough for the joint purchase of the undertaking. The popular view is in favour of the scheme.

Gas Exhibition and Cookery Lectures at Llandudno.—A short time ago the Llandudno Improvement Commissioners reduced the price of gas used for domestic purposes to 3s. per 1000 cubic feet; and, with the view of stimulating consumption, an exhibition of gas appliances was held in the Masonic Hall in that town from Monday to Friday last. It was organized by a local tradesman; and the stoves shown were supplied by Messrs. John Wright and Co., of Birmingham. Practical lessons in cookery were given twice daily by Mrs. J. B. Thwaites, and were well attended. The exhibition was in every way successful.

The Borrowing Powers of the Wigan Corporation Gas and Water Committees.—Regarding the statement which was made recently in the Wigan County Borough Council as to the various Committees and their capital expenditure (see *ante*, p. 303), some further remarks touching upon the subject were made at the last Wednesday's meeting. On the minutes of the Gas Committee being submitted, Mr. R. Johnson said he took it that, with respect to the application for increased borrowing powers to the extent of £40,000, this was practically a solution of the difficulty he pointed out at the previous meeting of the Council. The Gas Committee had spent money for which they had no borrowing powers, and were simply putting themselves right. Mr. M'Quaid asked how much of the £40,000 had already been expended. Mr. Holmes replied that nothing had been spent out of it at present. Mr. Stuart stated that the estimated expenditure for the next three years was £32,000; and they thought it wise to apply for borrowing powers to the extent of £40,000. He considered that, when such an extraordinary result had accrued from the gas undertaking, the ratepayers ought to be proud of it, especially when there was such a constant increase in the consumption of gas that the thousands of pounds already handed over as profits were bound to be followed by even more. This reflected great credit on the management; and he thought the Council ought to show their confidence in those who had charge of the undertaking by supporting the application. The minutes were adopted. Alderman Richards, the Chairman of the Water Committee, announced that the Local Government Board had consented, so far as they were concerned, to the additional borrowing powers asked for on behalf of the water undertaking.

METROPOLIS WATER SUPPLY.

The London Water Question and the Birmingham Water Scheme.

Our readers will remember that the Committee of Members of Parliament and other gentlemen interested in the question of the water supply of the Metropolis, as it will be affected by the Birmingham water scheme, whose proceedings were recorded in the JOURNAL last week, arranged to have another meeting on the 29th ult., to hear the result of an interview held by a Sub-Committee with representatives of the Birmingham Corporation and the members for that city.

In accordance with this arrangement, a meeting was held in one of the committee-rooms of the House of Commons on Monday last week, under the presidency of Sir J. Lubbock, Bart., M.P. It was reported that the Committee appointed to confer with the Birmingham members were satisfied that the improvement of the water supply of the city was a matter of urgency, and that, after hearing the promoters' explanations, they were not prepared to recommend that the scheme should be opposed. In order, however, that London should be in no way hampered in the future, the Committee suggested that two clauses should be added to the Bill—the first giving the Metropolitan authorities the right to cross any of the aqueducts proposed to be constructed; and the second providing that any arrangements with regard to compensation should be fair to London as well as to Birmingham. Regret was expressed that it should be necessary to proceed with the Bill pending the forthcoming inquiry by a Royal Commission; but it was agreed that the measure should not be opposed if the promoters were willing to amend it as suggested. It is understood that the Engineers of the Birmingham scheme do not see any objection to the insertion of the proposed clauses.

At the meeting of the London County Council on the following day, Sir J. Lubbock informed the members of what had taken place at the conferences held since the previous meeting of the Council (which now met for the last time prior to its dissolution). He stated that they were assured that an additional supply of water for Birmingham was a necessity. Mr. Chamberlain said that to obtain it would require at least eight years; and, as prudent men, they must look well ahead. They would, however, meet the Metropolitan and other Members of Parliament on points of detail. They urged strongly that, in the opinion of their Engineer, there would be a sufficient supply of water left for London. They courteously, however, consented to postpone the second reading of the Bill till Tuesday, the 8th inst. He was informed that there was considerable opposition to the Bill in Birmingham itself. The result of the interview was communicated on the previous day to a second conference of the Metropolitan and Home Counties Members, when much regret was expressed that any further appropriation of water-bearing areas should be agreed to until the Royal Commission had reported. At the same time, though no resolution was arrived at, there was a general feeling that, if the needs of Birmingham were so very urgent (which, of course, would have to be proved to the satisfaction of the Committee on the Bill), and subject to some agreement on details, it would not be reasonable to oppose the second reading. It was hoped, however, that the Bill would not be passed by the Committee unless the urgency of the project was clearly proved. At a later stage, the Water Committee submitted a special report, with the following recommendation: "That this Council trust that Parliament will not pass the Birmingham Corporation Water Bill before the water consumers of the Metropolitan area have had an opportunity of putting their case before the Royal Commission, except on the clearest possible evidence that the urgency of the matter in the case of Birmingham is so great that it must be pushed forward immediately, without regard to the requirements of the population of the Thames basin; and the Council hope that, should the Birmingham Bill be referred to a Select Committee, an instruction will be given to the Committee in this sense." Mr. Lloyd moved, as an amendment—"That this Council will take every step to prevent the Birmingham Water Bill being passed until the Royal Commission has reported." After a brief discussion, the amendment was rejected, and the recommendation agreed to.

CITY OF ST. PETERSBURG NEW WATER-WORKS COMPANY, LIMITED.

The Ordinary General Meeting of this Company was held last Thursday, at the Cannon Street Hotel, E.C.—Mr. W. T. WESTERN in the chair.

The accounts for the year showed that the gross receipts for water had been 255,420 roubles; and the miscellaneous profits amounted to 6875 roubles. The working expenses came to 98,247 roubles; leaving a balance of 164,048 roubles (equal nominally to £22,168), against 152,022 roubles—being an increase at the rate of about 7¾ per cent. From this balance had to be deducted for difference in exchange £4413; and for general charges of management (including income-tax in Russia and in England), £1332. Allowing for interest received, there remained a net profit of £16,449. The year's interest on the debentures and the "B" debenture stock absorbed £7774 and left a balance of £8675 to the credit of profit and loss. The Directors proposed to make a further payment of 10 per cent. on the "B" debenture stock on account of arrears of interest; and these would thereby be reduced to £7591. The report stated that no progress had been made with the appeal of the Municipality in the action as to payment for meters.

The CHAIRMAN said the course of events during the past year had been very favourable. The increase in the gross receipts for water was a little under 9000 roubles, and in the miscellaneous receipts 3600 roubles. On the other side, the expenses were only 500 roubles more than they were last year—a circumstance which reflected credit on their Manager in Russia. The rate of increase had not been so great as in some previous years; but this was natural, for they were now supplying all the better class of houses in their district, and were more and more dependent upon the smaller property for an increase. The rate of exchange, which was a matter of great concern to the Company, had

unfortunately been unfavourable, and but for the circumstance that, in the first half of the year, they brought over all the funds they could, the result would have been more against them than it had been. The net outcome was that the Company had earned about £200 more than in 1890. The shareholders would be pleased to know that, with the exception of the debenture debt (which was now in the position of being amply secured), the Company had practically no liabilities. The subject which probably was most in their minds was whether or not the Municipality were going to buy the Company's undertaking. During the year the Directors received an intimation from the Municipality that they were about to take up the matter; and they appointed a Commission to investigate it. Several meetings had been held by them, to which the Company's representative was invited; and he had, under the instructions of the Board, given all the information that was required as to the accounts and working of the concern, so as to put them in a position of being able to judge as to the advisability or otherwise of acquiring the property. The Municipality had also appointed another Commission of experts, who had inspected the whole of the machinery and plant; but up to the present, no definite communication had been made to the Directors. The date at which the Municipality had the right to take over the undertaking was May 31. He concluded by moving the adoption of the report and accounts.

Mr. R. S. GUINNESS seconded the motion.

The CHAIRMAN, in reply to questions, said the town had the option of purchasing the undertaking in one of two ways. First, they might pay the Company by an annuity—that was, they might take the present balance-sheet and say, "Your last year's profits amounted to 160,000 roubles; and we will pay you that amount for 25 years." The second option they had was that they could pay a lump sum down, which would be equal to fourteen times the annual income. In the event of the town not agreeing to purchase, the Company would remain in its present position.

The motion was carried.

The retiring Directors (Lord E. S. Churchill and Mr. R. S. Guinness) and the Auditors were re-elected; and the proceedings then terminated.

Sales of Shares.—Among some miscellaneous shares sold by auction, by Messrs. Suddards and Stansfield, at Bradford, a few days ago were fifteen original shares in the *Clayton, Allerton, and Thornton Gas Company*, which were disposed of at £18 10s.; and ten fully-paid £10 shares in the *Kildwick Parish Gas Company* which realized £12 5s.

Gas Plant for Australia.—The Whessoe Foundry Company, Limited, of Darlington and London, have just received a further large order for gas plant—comprising purifiers, valves, and connections, a telescopic gasholder, and wrought-iron tank—from Australia. This fact shows that the gas industry continues to develop in the colony.

Extension of the St. Helens Gas-Works.—The question of the extension of the St. Helens Corporation Gas-Works has for some time been considered by the Gas Committee, and negotiations have been in progress for the purchase of the property adjoining the works. The Manager (Mr. Samuel Glover) reported at the last meeting of the Committee that an extension of the retort-house would be shortly required; and the matter was referred to a Sub-Committee, who are already taking into consideration the illuminating power of the gas.

New Offices for the Wrexham Water Company.—The old offices of the Wrexham Water Company having been found altogether inadequate to meet the requirements of the business, new premises have been erected from the designs of Mr. A. C. Baugh. The building was commenced in February of last year, and finished in December; the Company taking possession on the 24th of that month. The completed premises may be justly described as model offices; being admirable in design, substantially built, and replete with every improvement devised by modern science for the economy of time and space, the practical application of the most approved sanitary principles, and the expedition of business in every department connected with the Company's undertakings. The contract was entrusted to Mr. W. E. Samuel; the amount being £2100.

The Progress of the Keswick Electric Light Company.—From the annual report of the Directors of the Keswick Electric Light Company, it appears that during the past year they have experienced great difficulties in having to run the station with plant only partially supplied with water power, in consequence of which considerable expenditure has been incurred in providing steam power to supply the deficiency. It is stated that the business of the Company continues to increase; and in order to meet the requirements, it has been found necessary to make considerable extensions in the main-wiring, the advantages of which to the Company are not yet fully felt. The accounts show a balance upon the year's working of £87, which, being added to the balance from the previous year, makes a sum of £122. The Directors propose the payment of a dividend of 3 per cent., which will leave £44 in hand. The receipts from consumers amounted to £542.

The Recent Proceedings against the Chelsea Water Company.—The Secretary of the Chelsea Water Company (Mr. G. H. Gill) has sent to the papers, by the desire of his Directors, an explanation in connection with the proceedings lately taken against the Company by Mr. Elgar, for cutting off the supply of water to his premises, as reported in the JOURNAL last week. He admits that the Company's collector, in demanding from Mr. Elgar a water-rate for a longer period than that for which his occupancy of the house rendered him liable, not only exceeded his duty, but acted in direct contravention of his instructions. These facts would, Mr. Gill says, have been explained to the Magistrate at the adjourned hearing on the 27th ult.; but he, unfortunately, declined to hear any statement from the Counsel representing the Company. He adds that the Directors are, as may well be supposed, very sincerely annoyed at the treatment Mr. Elgar has received at the hands of their collector, and they will endeavour to at once make such further rules and regulations as will render the repetition of such an occurrence impossible. Mr. Archibald Dobbs has offered a few comments on Mr. Gill's letter; stating that the chief office repeated, in a letter signed by the Assistant-Secretary, the exact claim made by the collector, who, he says, seems to have done his duty faithfully to the Company, and he accuses the authorities of want of chivalry, to say the least, in trying to throw the blame upon their servant.

NOTES FROM SCOTLAND.

From Our Own Correspondents.

Saturday.

Monday was a busy day with the Edinburgh and Leith Gas Commission—the business being such that the daily press, which frequently turn off the doings of the Commissioners at their monthly meetings in a paragraph, devoted as much as a column to it. The business was of just such a sort as good readable matter could be made for the general public; though to the practical man much of it will probably appear as "small beer." There was little of a technical nature about it; and it could not escape observation that, when that element was removed, the Commissioners were much more at home, and talked more sensibly than they often do. From this, I reason that a Gas Commissioner ought to hold office for a considerable time. Three years is not long enough to acquire a knowledge of the business which would enable them to speak with authority. One has but to look back upon some of the early remarks of new-comers to see how true this is. Those Gas Commissioners who are content to sit at the feet of the officials for a year or two, make the best in the end; those who begin airing their crude notions as soon as they take their seat on the Commission usually talk much nonsense, and probably do harm by their indiscretion before they settle down in the team. A Gas Commission is therefore a place where "new blood" should be introduced sparingly. This opinion, I know, flies directly in the face of that which is generally entertained by the community. There is an almost universal distrust, most unaccountable but still most true, of all connected with gas supply; and the common notion, assiduously fostered by persons who aspire to office, is to turn out the wicked old incapables, and to replace them by reformers. I think I have before advocated a school of instruction for Gas Commissioners. Such a proposal, of course, could only be made in satire; but it is within reason to suggest two things by which the business of at least the Edinburgh and Leith Gas Commission might be facilitated. The first would be that new-comers should, in all technical matters, accept implicitly, and support, within the Commission and outside of it, the opinions of the responsible officials who are in charge of their business. The next is that those who are more experienced—the Conveners of Committees—should each introduce their own work to the Commission, giving a short explanatory statement of it. This would often suffice, and would save irrelevant and sometimes bombastic discussion. The reflex influence on the public mind would be considerable, as the belief would gain ground that the Commissioners were a work-a-day body of men in whom confidence might be placed. It is to be noted with satisfaction, in connection with Monday's meeting, that Mr. Kinloch Anderson, the Convener of the Works Committee, spoke moderately and sensibly upon the subject of the coal supply for next year, and that the other Commissioners had the good judgment to keep silence and not to indulge in heroic remarks upon a delicate and intricate subject. The stair-lighting question, though some of your readers may look upon it as scarcely worthy of so much attention, was the principal matter before them. Probably two-thirds of the community in Edinburgh live in tenements which are reached by common stairs; and it will thus be seen that it must, of necessity, be a subject of great importance. That it is of importance to the Gas Commissioners, was shown by the remark of Provost Aitken that if all the stair-lights were kept burning till morning, having only been paid for till midnight, the annual loss to the Commissioners would be £5000. The remedies proposed were that the lights should be charged for for the whole night; and that the lighting should be left, as at present, to the residents, but that the extinguishing should be undertaken by the Corporation. The latter proposal is open to several objections; and the only satisfactory solution of the difficulty, unless the present method is to be enforced, is to burn them all night. The question of the irregularities in the working of the Surveyors' Department was brought up by Mr. Kinloch Anderson. The decision of the Commissioners was such as no one can take exception to; but the reading given to it by the Lord Provost, is not so free from objection. Though the Lord Provost be the head of the Gas Commission, his position is more one of courtesy than of power. The work of the Commission is really done by its officials. The Commissioners are little more than a consultative committee. They could be done without; the officials could not. The real head of the Commission is the Treasurer; and Mr. Gibb, who holds the office, was justified in raising the question as to how his powers were to be affected by the Lord Provost's dictum that in future the heads of departments were to be independent. The Lord Provost surely spoke without reflection when he reduced the Treasurer's power to that of giving advice to the heads of departments, and reporting to the Commissioners. This means that henceforth the staffs are not to look to the permanent and stable element in the constitution of the Commission, but to Commissioners, who are the unstable and inconstant element. The departments, set up in independence, are certain to clash; and in the absence of someone at the head of the house, the Commissioners will be pestered by applications to settle differences, and the work of "a house divided against itself" will not be satisfactorily performed. The Lord Provost seems to be afraid of heads of departments shirking their duties. How is the granting of autonomy to them to prevent that? It is now no person's duty to keep an oversight of the staff; and to report whatever may be going wrong in another department equally independent with your own, will savour of tale-bearing. The head of a department is not likely to report himself when he feels disposed to shirk his duties; and there is no one else who has any call to do it, except the staff he has under him. This is such a complete reversal of all authority, that I cannot think that the Lord Provost meant what he said; and therefore a return to ways of reason ought to be one of the Commissioners' first steps. Among other items before the Commissioners, it was satisfactory to observe an increased output of gas in January of nearly 11 million cubic feet over that of January of last year. It was also a pleasure to see the courteous manner in which the portrait of the late Mr. J. K. Watson was received, and ordered to be hung up in the room in which, in the old days, his weighty words of counsel were so often heard. The portrait is an excellent likeness of the late Mr. Watson.

An action has lately been decided by Sheriff Balfour in the Glasgow Small Debt Court which has a considerable amount of interest for

landlords and house factors, as also for gas corporations and gas companies whose operations include a stove-hiring department. It was raised at the instance of the Glasgow Corporation Gas Trust against Mr. H. D. Sharp, house factor, of Paisley Road, Glasgow, and the amount sued for was the value of a gas-stove and fittings, which had been hired by the pursuers to the tenant of a house for which the defender was the factor. The tenant of the house being in arrears with her rent, the factor sequestrated and sold certain of the effects which were in the house, including the gas-stove and fittings hired from the Corporation. The defender contended that the gas-stove and fittings, although hired articles, were in law presumably the property of the tenant, and therefore fell under the landlord's hypothec. Mr. John Bowers, from the Town Clerk's department, who appeared for the Corporation, submitted that whatever the common law was with reference to hired articles falling under the landlord's right of hypothec, the principle contended for by the defender did not apply to the case in question. By their own Gas Acts, and the General Gas Acts incorporated therewith, the Corporation Gas Commissioners have power to let for hire any meter for ascertaining the quantity of gas consumed, and "any fittings for the gas" supplied by them; and in the case of *The Gaslight and Coke Company v. Hardy*, decided by the Court in England in 1886, it was held that the words "any fittings for the gas" included gas-stoves. By section 14 of the General Gas-Works Clauses Act, 1847, which had been incorporated with the Gas Acts of the Glasgow Corporation, it was also provided "that such meters and fittings shall not be subject to distress or landlord's hypothec for rent of the premises where the same may be used, nor to be taken in execution under any process of a court of law or equity, or any fiat or sequestration in bankruptcy against the person in whose possession the same may be." Under the circumstances submitted by Mr. Bowers, Sheriff Balfour held that he must find for the Corporation; and he gave decree in their favour for £1 16s. 6d., with expenses.

The Gas Committee of the Hamilton Town Council reported to the monthly meeting of that body, which was held on Thursday, that they had had under consideration the question of the proposed extension of the gas-works, including suggestions made in reports by the Manager (Mr. Johnston) and by Mr. A. Gillespie, gas engineer, of Glasgow. It may be remembered that I alluded to Mr. Gillespie's suggestions a couple of weeks since. The Committee do not seem to be prepared to adopt the proposals contained in Mr. Gillespie's report, as they resolved to recommend that "in the meantime," with the view of meeting the temporary wants, ten new retorts if possible be erected on the space occupied by the smithy hearth; that the space behind the present retort-houses be roofed in and utilized as a coal-store; and that the old gasholder-tank be cleaned out and used as a stock tar-tank. They further decided to make another inspection of the works, and to consult with the engineer as to other proposed extensions. Mr. Brown, in the absence of Provost Archibald, moved the adoption of the Gas Committee's report, and said that the Council might rest assured that they would obtain the very fullest information as to the extension scheme before they adopted it. Mr. Tainsh, a former Convener of the Gas Committee, said that the extension of the works was needed, and should be gone on with. Mr. Sanders urged that the proposed expenditure would cover the introduction of the electric light; and Bailie Wylie remarked that the Committee were only advising at present the erection of ten retorts, which were absolutely necessary. Eventually the report of the Committee was adopted.

The subject of stair-lighting is being dealt with in a Bill which the Police Commissioners of Dundee are promoting in Parliament this session. As deposited, the Bill contained what is known as the Glasgow clause, which provides that the lighting and extinguishing of the lights shall be performed by the Corporation, the cost being laid upon the owners of property, who are entitled to recover from the occupiers 15s. in respect of each light. The Committee in charge of the Bill, on Thursday night reconsidered this provision, and resolved to substitute the Edinburgh clause for the Glasgow one, with modifications. The Edinburgh clause was given in these "Notes" last week. The modifications upon it are that the £10 rent limit is removed, and the proprietor may recover the cost of lighting from occupiers of whatever rent; and a limit charge of 20s. each for stair-lights and of 25s. each for lights in courts and passages is imposed. It is curious to see the Dundee Police Commissioners adopting a provision which has been the occasion of so much friction and inconvenience in Edinburgh.

The failure of Messrs. John Dobbie, Sons, and Co., of Leith, which I mentioned last week, was the subject of consideration by the Finance Committee of the Arbroath Gas Corporation on Monday night. The Convener read a circular from the trustee appointed by Mr. Dobbie under a trust-deed, intimating stoppage of payment. The contract with the Gas Corporation for their residuals, is guaranteed; and the Committee resolved to hold the cautioner liable, and to retain the residuals until an arrangement is made with him. It was also resolved to ask the cautioner to pay immediately a sum of £341 due.

In connection with the petitions to the Court of Session relating to the affairs of the Glasgow Alum and Ammonia Company, it was to-day reported to the First Division that a settlement of the differences between the petitioning parties had been arrived at. The Barrhead Gaslight Company withdraw their petition, and consent to that of the Alum and Ammonia Company being granted.

The death has just been announced of Mr. William Motherwell, of Airdrie, who was one of the oldest inhabitants of the district, as he was also one of the most respected citizens of the burgh. He was long an active Director of the Airdrie Gas Company; and for upwards of twenty years he was likewise a Director of the Airdrie and Coatbridge Water Company. His extensive knowledge of business matters rendered him specially qualified to take a share in the management of those and various other commercial and industrial undertakings of the town of Airdrie and neighbourhood. His death severs one of the few remaining links that connected the first decade of the century with the last. He was born in 1809.

I omitted to mention in last week's "Notes" that the actual revenue derived by Glasgow Gas Trust from the sale of residual products during the financial year (beginning on June 1) up till Feb. 10 was £72,161 3s. 1d., as compared with £65,843 3s. 7d. during the corresponding period of 1891; thus showing an increase of £6317 19s. 6d.

At the last meeting of the Glasgow Police Commissioners, it was reported by ex-Bailie Gray, Convener of the Watching and Lighting Committee, that the stair-lighters in the town's employment had applied for an increase of wages amounting to 2s. per week. He said that the Committee had gone carefully into the question, and had come to the conclusion that the stair-lighters had no grievance.

The electric lighting enterprise hitherto carried on in Glasgow from two central stations—one low pressure and the other high pressure—by Messrs. Muir, Mavor, and Coulson has this week passed into the hands of the Corporation, to be conducted henceforth by the Gas and Electric Lighting Committee. The first new contract for electric light actually taken in hand by the Committee is for a billiard saloon, involving somewhere about 200 16-candle lamps, for which, in the meantime, high-tension current alone is available. It is stipulated in this case that the customer must pay all the expenses for running the requisite (overhead) wires and the fitting arrangements, as also a charge of 8d. per Board of Trade unit. In the course of some months, a new low-pressure station will be built and equipped from plans by Professor Kennedy, for supplying current for the west-central and more westerly portions of the city.

COAL TRADE REPORTS.

From Our Own Correspondents.

Lancashire Coal Trade.—During the past week, business al through the coal trade of the Lancashire district has been altogether disorganized by the unreasoning pressure on the part of consumers to get in extra supplies, in anticipation of the approaching stoppage of the pits; the demand in most cases far exceeding anything likely to be the actual requirements during the probable cessation of work. The result is that the rush of orders sent in to collieries has filled up their books for fully a month ahead; and although a number of the leading firms have not made any formal advance upon their list rates, there has been a decided—and in many cases considerable—upward movement in prices generally. As regards round coal, the advances in the open market have averaged 1s. 6d. to 2s. per ton; but in some instances quotations have gone considerably beyond these. At the pit mouth, best Wigan Arley ranges from 13s. up to 15s. per ton; Pemberton four-feet, and second qualities of Arley, 11s. to 12s.; common round coals, for house-fire and also for steam, forge, and general manufacturing purposes, averaging about 10s. per ton. Some of the iron-works and other establishments are closing, rather than pay any material advance in the price of fuel; but as regards gas-works, where a stoppage of operations is out of the question, extra supplies have been sought, subject to prices current for the time being. Engine classes of fuel seem to have been most seriously affected by the present crisis in the coal trade; and absurdly fancy prices are in many instances being quoted where customers are pressing for extra supplies. But buyers generally are readily paying an advance of 2s. per ton upon recent quotations; while in some instances sellers are asking fully 4s. per ton upon the prices they would willingly have taken only a week or two back. Burgy may be quoted as averaging about 8s. to 9s. per ton; best slack, 6s. 6d. to 7s. 6d. and 8s.; with common sorts not obtainable under about 4s. to 5s., and this only in very exceptional cases. On the other hand, as much as 10s. per ton has been quoted for slack at the pit's mouth.

Northern Coal Trade.—The coal trade has for the past week been extremely excited; and prices for several kinds have moved up in an erratic fashion. Although it was well known that the Northumbrian miners would continue to work even in the event of a "stop week," the action of the men of Durham was doubtful, and, in consequence, prices rose for many kinds though not for all. Best Northumbrian steam coals have advanced very slightly—to 10s. per ton, free on board; and at this price the demand has increased, though an abundant supply has been maintained. Second-class coals have been at about 1s. per ton less. Small steam coals have risen, because many manufacturers have bought them in place of Durham coals; and the price is about 5s. per ton, free on board. In household coals there has been no alteration; the supply being largely from collieries that are not yet affected by the strike. Gas coals have been most influenced by the sharp demand; and vast quantities have been shipped to London. In addition to the ordinary steamers, others have been chartered; and the demand has been so great that the rate of freight has in a fortnight risen from 3s. 4d. per ton, Tyne to London, to 4s. 6d. per ton. It is difficult to say the price of gas coals; but it is certain that from about 8s. 3d. they rose to 9s. 6d. per ton, which latter figure was paid, while higher prices have been asked. Contracts, however, are being arranged on a lower basis; and one for Rotterdam is believed to have been concluded at what is considerably below the figure that ruled last year. With the collapse of the movement, it is tolerably certain that the consumers of coals—gas, household, and manufacturing alike—have stocked so largely that there will be a great fall in the prices of fuel. Bunker coal is steady, and manufacturing coal has shot up very considerably. Coke is rather quiet; some furnaces having been put out that took coke from this district. The price of best blast-furnace coke is about 15s. 6d. per ton free on board. Gas coke has been offered and sold more freely, and there has of late been more disposition to look at the merits of this fuel for household purposes; but the price is still very low.

West of Scotland.—There is a firmer tone in the coal trade in this district, caused by the threatened mining difficulties in England. As yet there is no indication that the Lanarkshire colliers intend to co-operate in the holiday policy. Within the past few days a rather better demand has been experienced for Lanarkshire coal; and a number of shipping contracts have been placed. Prices are firm at the old quotations; and in some instances, it is understood, sellers have been able to command a slight advance. Prices may be quoted: Main, 7s. 9d. to 8s.; ell, 8s. 3d. to 8s. 6d.; splint, 8s. 6d. to 8s. 9d.; steam, 10s. 3d. to 10s. 6d. The shipments of coal from Scotch ports ast week show a gain over the previous week of about 17,000 tons, and an increase as compared with the corresponding six days of last year of fully 6000 tons.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *March* 5.

Sulphate of Ammonia.—The market remains *in statu quo;* and there is no movement either up or down. There is a fair inquiry, principally from dealers, which seems to prevent a further decline, and which the peculiar inertness of the Continental demand might otherwise have brought about. The return of severe weather checks the home demand; but when the position is thoroughly sifted, there is really no large quantity available, and the production is, of course, now on the decrease. There are at present no buyers above £10 5s., f.o.b. Hull, Goole, or Leith; but Liverpool sulphate can be secured at a little below this figure. Nitrate is dull, at 9s. 4½d.

LONDON, *March* 5.

Tar Products.—The depression in these has been somewhat accentuated during the week; benzols having again gone easier, and buyers being scarce. Pitch for forward delivery is also lower; as the users of it hold off, anticipating much lower prices. There has not been much doing in anthracene; nor is there any great variation in its value. Creosote and common oils are also flat, with but few buyers. A considerable quantity is now being used as fuel—especially in districts where only high-price coal is available. The value of tar is receding, in sympathy with products; and a large contract was settled last week at 15s. The average prices for the week are as follows: Tar, 15s. Pitch, 31s. Benzol, 90's, 2s. 4½d.; 50's, 1s. 9d. Toluol, 1s. 4d. Solvent naphtha, 1s. 3d. Crude benzol naphtha, 30 per cent., 11d. Creosote, 1d. Naphthalene salts, 25s.; pressed, 45s. Carbolic acid, crude 60's, 1s. 0½d.; 70's, 1s. 4d.; crystals, 5d. Cresol, 8½d. Anthracene (30 per cent.), "A" quality (nominal), 1s.; "B" quality, 8d.

Sulphate of Ammonia.—For forward delivery, prices are somewhat advanced; but for prompt, £10 to £10 2s. 6d., less the usual discount, is still the ruling value. Gas liquor (10 oz.) is quoted at 6s. to 7s. 6d.

Extension of the Horley Gas-Works.—Owing to the very large increase in the Horley Gas Company's sales of gas, the Directors have decided to make considerable extensions to their gasholder plant, coal-stores, mains, &c.; and Messrs. J. and H. Robus, of Bucklersbury, E.C., have secured the contract. It may be remembered that this firm erected the works originally from the plans of Mr. Jabez Church, M. Inst. C. E., the Company's Consulting Engineer, who has also designed the extensions now in progress.

The Gas-Works Purchase Question at Sutton Coldfield.—The result of the poll on the proposed purchase by the Sutton Coldfield Corporation of the local gas-works and the portion of the mains belonging to the Birmingham Corporation within the borough boundaries is as follows: In favour, 875; against, 1118—majority against 243. On the figures being announced by the Mayor at the public meeting of ratepayers last Saturday week, it is reported that they were received "with loud expressions of indignation."

Gas Exhibition at Parkgate.—An exhibition of gas cooking and heating appliances has lately been held, under the auspices of the Parkgate Local Board, at the Miners' Institute in that town. It was opened by Mr. J. Smith, Chairman of the Gas Committee, who remarked that the Board were desirous of increasing the sale of gas, and also of keeping the neighbourhood informed as to the latest novelties and appliances in gas cooking; and they had promoted the exhibition with a view of improving their finances. Mrs. J. B. Thwaites gave a series of interesting cookery lectures, which attracted crowded audiences. The exhibition was well attended.

Electrical Fittings, but no Light.—On Monday last week Mr. Commissioner Kerr disposed of the case of *The Brush Electrical Engineering Company, Limited*, v. *Satchwell*, in the City of London Court. The plaintiff Company, of 49, Queen Victoria Street, E.C., sought to recover £23 for supplying electrical fittings in April, 1891, to the defendants, Messrs. Satchwell and Co., auctioneers, of Bucklersbury, E.C. Mr. Poley, for the defendants, said they entered into a contract with the plaintiff Company to supply them with the electric light. To do this, of course, fittings, &c., had to be put up. This had been done; but it now appeared the plaintiffs could not put on the current, and consequently the defendants could get no light. Mr. Poole, for the plaintiffs, said his Company had no power to put on the light where the particular premises happened to be. Mr. Commissioner Kerr said he never heard of anything so monstrous. The contract was obtained by misrepresentation, which in law amounted to fraud; and now the plaintiffs wanted to make the defendants pay for fittings although they could not use them. Mr. Poole said he hoped the Court would not brand the plaintiffs with misrepresentation. Mr. Commissioner Kerr replied that he did, most unhesitatingly. Judgment was given for the defendants, with costs.

Welsh Interests and the Birmingham Water Scheme.—The Press Association states that Welsh interests are now rising against the Birmingham Water Bill just when the threatened opposition of the Metropolitan and Home Counties Members is being practically withdrawn, as intimated in another part of the JOURNAL. Before the second reading of the Bill, a course of action will be resolved upon by the Welsh Members, as well as by the Commons Preservation Society. It is stated that the Birmingham Corporation, in going into the head waters of the River Wye for their supply, propose to acquire 32,000 acres of common land, comprising about 390 small farms, having rights of common over the land in question. In view of this fact, the Right Hon. J. G. Shaw-Lefevre intends to move, at the second reading stage, that the Bill be referred to a Hybrid Committee, with instructions to report as to whether it is necessary to expropriate the common rights, and also whether it would not be possible to arrange for the public having continued access to the land. These points have been under the consideration of the Welsh Members, who also intend to protest against English towns taking possession of Welsh sources of water supply, which may sooner or later be required for the Principality, in view of the exceptionally rapid growth of the population in Glamorganshire, and the fact that the Rhondda Valley has more than once been within reasonable distance of a water famine.

The Quality of the Abergavenny Water Supply.—With the view of setting at rest any uneasiness that may exist as to the quality of the water supplied to Abergavenny, two samples have been submitted to Dr. Dupré, whose analyses thereof have been published. In both cases the water is pronounced to be in every respect high-class, and admirably adapted for drinking and domestic use generally.

The Birmingham Compressed Air Power Company.—This Company was incorporated by Act of Parliament (47 & 48 Vict., cap. 199) for the purpose of supplying compressed air in Birmingham; for distributing motive power; and the supply of air for ventilating, refrigerating, or blowing furnaces. Under a winding-up order made on Dec. 19 last, a statement of affairs has now been submitted by the Secretary and the Chairman, showing liabilities £4524, of which £1711 are unsecured, with an estimated surplus in assets of £4264; and, as regards contributories, a total deficiency of £119,155. From the observations of the Official Receiver (Mr. C. J. Stewart), it appears that the nominal capital of the Company is £300,000, divided into 30,000 shares of £10 each. On April 15, 1886, the Company entered into a contract for £129,714, with the City of London Contract Corporation, for the following purposes: (*a*) The construction of necessary works for an installation of 6000-horse power; (*b*) the purchase of land; (*c*) the issue of prospectuses, &c. In consequence of the insufficiency of the share subscription, the Company were unable to carry out their contract; and arrangements were accordingly made with the City Corporation whereby the proposed outlay on the works was reduced. On July 29, 1890, the contract was discharged by a deed of arrangement; sums of money, amounting in all to £106,538, having been paid to the Corporation. The Company commenced the delivery of air power in July, 1889. The failure of the undertaking is attributed to the fact that the mains for the supply of air power were laid to large consumers, who were not willing to pay a sufficiently remunerative price, instead of to smaller consumers, from whom, in proportion, more profits would have been obtained; also to the want of proper meterage and measurement, and to leakage and difficulties of supply which had not been foreseen.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

(For Stock Market Intelligence, see ante, p. 434.)

Issue.	Share	When ex-Dividend.	Dividend on Last Issue.	NAME	Paid per Share	Closing Prices.	Rise or Fall in Wk.	Yield upon investment.
£			p. c.	GAS COMPANIES.				£ s. d.
590,000	10	15 Oct.	10½	Alliance & Dublin 10 p. c.	10	16–17	..	6 3 6
100,000	10	,,	7½	Do. 7 p.c.	10	11½–12½	..	6 0 0
300,000	100	2 Jan.	5	Australian (Sydney) 5 % Deb.	100	105–107	..	4 13 5
100,000	20	27 Nov.	8	Bahia, Limited	20	12–14	..	11 8 6
200,000	5	12 Nov.	7½	Bombay, Limited	5	6½–6¾	..	5 11 1
40,000	5	,,	7½	Do. New	4	4¾–5¼	..	5 14 1
380,000	Stck.	26 Feb.	12½	Brentford Consolidated	100	205–215*	..	5 14 1
150,000	,,	,,	9½	Do. New	100	153–158*	..	5 17 1
220,000	20	16 Sept	11½	Brighton & Hove Original	20	40–42	..	5 9 6
888,500	Stck.	16 Sept.	5	Bristol	100	98–103	..	4 17 1
320,000	20	15 Oct.	11½	British	20	43–45	..	5 0 0
50,000	10	26 Feb.	11½	Bromley, Ordinary 10 p. c.	10	19–20*	..	5 15 0
51,510	10	,,	8½	Do. 7 p. c.	10	14–15*	..	5 13 4
328,750	10	—	—	Buenos Ayres (New) Limited	10	5–6	..	—
200,000	100	2 Jan.	6	Do. 6 p. c. Deb.	100	93–96	..	6 5 0
150,000	20	26 Feb.	8	Cagliari, Limited	20	24–26*	..	6 3 1
550,000	Stck.	15 Oct.	13*a*	Commercial, Old Stock	100	244–249	+1½	5 4 5
165,000	,,	,,	10*a*	Do. New do.	100	190–195	..	5 2 7
130,000	,,	30 Dec.	4½	Do. 4½ p. c. Deb. do.	100	118–123	..	3 13 2
800,000	Stck.	30 Dec.	13	Continental Union, Limited	100	222–227	–3	5 14 6
200,000	,,	,,	10	Do. 7 p. c. Pref	100	185–195	..	5 2 7
75,000	Stck.	16 Sept.	10	Crystal Palace District	100	190–200	..	5 0 0
486,090	10	29 Jan.	10	European, Limited	10	19–20	..	5 0 0
354,060	10	,,	10	Do. Partly paid	7½	14–15	..	5 0 0
5,470,820	Stck.	12 Feb.	12	Gaslight & Coke, A, Ordinary	100	210–215	–3½	5 11 8
100,000	,,	,,	4	Do. B, 4 p. c. max.	100	94–97	..	4 2 5
665,000	,,	,,	10	Do. C, D, & E, 10 p.c. Pf.	100	245–250	..	4 0 0
30,000	,,	,,	5	Do. F, 5 p. c. Prf.	100	116–121	..	4 2 9
60,000	,,	,,	7½	Do. G, 7½ p. c. do.	100	169–174	..	4 6 2
1,300,000	,,	,,	7	Do. H, 7 p. c. max	100	150–154	+1½	4 10 11
463,000	,,	,,	10	Do. J, 10 p. c. Prf.	100	241–246	..	4 1 3
476,000	,,	,,	—	Do. K, 6 p. c. Prf.	100	145–150	..	4 0 0
1,061,150	,,	11 Dec.	4	Do. 4 p. c. Deb. Stk.	100	113–116	..	3 9 0
294,850	,,	,,	4½	Do. 4½ p. c. do.	100	118–123	..	3 13 2
908,000	,,	,,	6	Do. 6 p. c. do	100	163–168	..	3 11 5
3,800,000	Stck.	12 Nov.	12	Imperial Continental	100	221–225	–1	5 6 8
75,000	5	26 June	6	Malta & Mediterranean, Ltd.	5	4–4½	..	6 13 4
560,000	100	1 Oct.	5	Met. of Melbourne, 5 p. c. Deb.	100	108–110	..	4 10 11
541,920	20	27 Nov.	6½	Monte Video, Limited	20	15–16	..	8 2 6
150,000	5	27 Nov.	10	Oriental, Limited	5	8½–9	..	5 11 1
60,000	5	30 Sept.	7	Ottoman, Limited	5	4–5	..	7 0 0
166,870	10	26 Feb.	2	Pará Limited	10	2½–3½	..	—
420,000	100	3 Nov.	6	People's Gas of Chicago—1st Mtg. Bds.	100	100–105	..	5 14 3
500,000	100	1 Dec.	6	2nd Do.	100	100–105	..	5 14 3
150,000	10	15 Oct.	10	San Paulo, Limited	10	9–10	–½	10 0 0
500,000	Stck.	26 Feb.	15½	South Metropolitan, A Stock	100	266–271*	..	5 14 5
1,350,000	,,	,,	12	Do. B do.	100	220–225*	–1	5 6 8
200,000	,,	,,	13	Do. C do.	100	232–237*	..	5 9 8
725,000	,,	30 Dec.	5	Do. 5 p. c. Deb. Stk.	100	138–143	..	3 10 0
600,000	Stck.	16 Sept.	11½	Tottenham & Edm'nton, Orig.	100	—	..	—
				WATER COMPANIES.				
729,331	Stck.	30 Dec.	10	Chelsea, Ordinary	100	250–255	–6	3 18 5
1,720,560	Stck.	15 Oct.	8	East London, Ordinary	100	203–208	–1	3 16 11
544,440	,,	30 Dec.	4½	Do. 4½ p. c. Deb. Stk.	100	136–140	..	3 4 3
700,000	50	11 Dec.	8	Grand Junction	50	98–102	–1	3 18 5
708,000	Stck.	12 Feb.	10½	Kent	100	260–265	–3	3 19 3
1,043,800	100	30 Dec.	9½	Lambeth, 10 p. c. max.	100	222–227	–3	4 3 8
406,200	100	,,	7½	Do. 7½ p. c. max.	100	189–194	..	3 17 4
260,000	Stck.	30 Sept.	4	Do. 4 p. c. Deb. Stk.	100	120–123	..	3 5 0
500,000	100	12 Feb.	12½	New River, New Shares	100	330–335	..	3 12 4
1,000,000	Stck.	29 Jan.	4	Do. 4 p. c. Deb. Stk	100	124–127	+1	3 3 0
902,300	Stck.	30 Dec.	6½	S'thwk & V'xhall, 10 p. c. max.	100	144–149	–1½	4 7 3
126,500	100	,,	6½	Do. D 7½ p. c. do.	100	140–145	..	4 9 8
1,155,066	Stck.	11 Dec.	10	West Middlesex	100	244–249	..	4 0 4

*Ex div.

a Next dividends will this rate.

GWYNNE & BEALE'S PATENT GAS EXHAUSTERS AND ENGINES.

Telegrams: "GWYNNEGRAM LONDON."

GWYNNE & CO.,

TELEPHONE No. 2698.

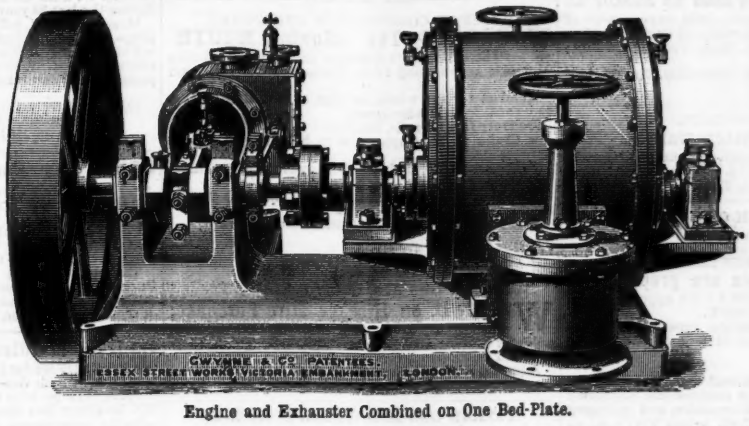
HYDRAULIC AND GAS ENGINEERS, ESSEX STREET WORKS, VICTORIA EMBANKMENT, LONDON, W.C.

Thirty-three Medals at all the Great International Exhibitions have been awarded to GWYNNE & Co., for Gas Exhausters, &c.

They have never sought to make price the chief consideration, but to produce Machinery of the very highest quality.

The result is that in every instance their work is giving the fullest satisfaction.

They have completed Exhausters to the extent of 30,000,000 cubic feet passed per hour, which are giving unqualified satisfaction in work, and can be referred to.



Engine and Exhauster Combined on One Bed-Plate.

GWYNNE & Co.'s Exhausters are constructed of large size to pass the required quantity of Gas at very slow speeds; the wear and tear being reduced to a Minimum.

Catalogues and Testimonials sent on Application.

Their Exhausters can be made, when desired, on their New Patent Principle, to pass Gas without the slightest oscillation or variation in pressure.

NO OTHER MAKER CAN DO THIS.

Makers of GAS-VALVES, HYDRAULIC REGULATORS, VACUUM GOVERNORS, STEAM-PUMPS for Tar, Liquor, or Water; PATENT SELF SEALING AND CLEANSING RETORT-LIDS AND MOUTHPIECES; CENTRIFUGAL PUMPS and PUMPING ENGINES specially adapted for Water-Works, raising Sewage, &c.

Also GIRARD and other TURBINES, HIGH-SPEED ENGINES, DYNAMOS, &c., &c., for ELECTRIC LIGHTING.

NOTICE TO ADVERTISERS.—COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office *not later* than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or Stoppages of PERMANENT ADVERTISEMENTS should be received not later than the FIRST POST on SATURDAY.

OXIDE OF IRON.

O'NEILL'S Oxide has a larger annual sale in the United Kingdom than all other Oxides combined. Purity and uniformity of quality guaranteed. Pamphlet, "How to Purchase Bog Ore," to be obtained on application.
Gas Purification and Chemical Company, Limited, Palmerston Buildings, Old Broad Street, London, E.C.
JOHN WM. O'NEILL, Managing Director.

GAS PURIFICATION AND CHEMICAL COMPANY, LIMITED.

ANDREW STEPHENSON, Agent.
Please address all communications to the Company, as above.

ANDREW STEPHENSON, Agent for BRIN'S OXYGEN COMPANY, Limited, Westminster, S.W.
City Address: 182, Gresham House, Old Broad Street, LONDON, E.C.

WINKELMANN'S "Volcanic" Fire CEMENT. (Fire resistance, 4500° Fahr.)
Prices, particulars, and directions for use on application to ANDREW STEPHENSON, 182, Gresham House, Old Broad Street, LONDON, E.C.

CANNEL COAL, ETC.

JOHN ROMANS & SON, EDINBURGH.
Gas Engineers, supply all the most approved SCOTTISH CANNELS; also FIRE-CLAY GOODS, CAST-IRON PIPES, and other APPARATUS for GAS AND WATER WORKS.
Prices, &c., will be forwarded on application to No. 80, ST. ANDREW SQUARE, EDINBURGH, / NEWTON GRANGE, NEAR DALKEITH, } SCOTLAND.

FRIEDRICH LUX, Ludwigshafen am Rhein; and at No. 142, Great Portland Street, London, W.
LUX'S Gas Regulators for every consumption.
LUX'S single-stem Pressure-Gauges.
LUX'S Regulator for Gas-Engines.
LUX'S Gas-Balance.
LUX'S new Gas Regulator for Inverted Lamps; and other Apparatus for Gas Lighting, &c.

LIQUOR and Tar wanted.
BROTHERTON AND CO., Ammonia and Tar Distillers, LEEDS and WAKEFIELD.

WANTED, a Situation in Gas-Works.
Used to Shovel Charging. Good references. Apply to G. REVILL, Spital Hill, East Retford, NOTTS.

WANTED, a Situation as Draughtsman or CLERK OF WORKS. First-class references.
Address No. 2068, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, by a Gas Manager, the MANAGEMENT of a GAS-WORKS, making 30 to 40 Millions, at home or in the Colonies. Thoroughly practical in Gas, Water, and Electric Light. Good testimonials and references.
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JAMES LAWRIE & CO. supply Best SCOTCH CANNEL COALS, Best FIRE-CLAY RETORTS, BRICKS, TILES, and LUMPS; BOILER SEATING BLOCKS, FLUE COVERS, and SILICA BRICKS for SPECIAL FURNACE WORK; COKE BARROWS, BOGIES, and SMALL WAGONS.
Postal Address: 1, WHITTINGTON AVENUE, E.C.
Telegram Address: "EIRWAL LONDON."

W. C. HOLMES & Co., Huddersfield, AND 80, CANNON STREET, LONDON,
Contractors for Gas-Works complete, Makers of Gasholders, Purifiers, Scrubbers, Condensers, Retort Fittings, &c., Improved Valves, Engines, and Exhausters. Also for Collingwood's Regenerative Retort-Settings.
*** See Advertisement p. 461 of this week's issue.
Cablegrams: "Ignitor London." Telegrams: "Holmes Huddersfield."

J. & J. BRADDOCK, Globe Meter Works, Oldham.
First-Class Award, Melbourne Exhibition, 1889, for WET AND DRY GAS-METERS, STATION METERS, AND GOVERNORS, PRESSURE-GAUGES, STREET LAMPS AND PILLARS, &c.
Telegraphic Address: "Braddock, Oldham."

SADLER AND CO., LIMITED, MIDDLESBROUGH; ULVERSTON (BARROW); PORTSMOUTH; CARLTON; STOCKTON; 70, Wellington Street, GLASGOW; 58, Fountain Street, MANCHESTER; and 85, Water Street, NEW YORK. Tar Distillers, Manufacturers of all TAR PRODUCTS, ALIZARINE and other TAR COLOURS, BICHROMES, OXALIC ACID, ALKALIES, LIQUOR AMMONIA, AMMONIA SULPHATE, &c.
Head Office: MIDDLESBROUGH. Correspondence invited.

WANTED, a good steady Main and SERVICE LAYER able to take charge of men. To a good and reliable man, good Wages and constant Work will be given.
Apply to J. and H. ROBUS, Contractors for Gas and Water Works, 20, Bucklersbury, LONDON, E.C.

OAKENGATES GAS COMPANY, SALOP.

WANTED, a sober and reliable man as GAS-FITTER, MAIN and SERVICE LAYER, and METER INSPECTOR, and to make himself generally useful about the Works. Wages, 24s. per week, with Cottage on the Works, Fuel, Gas, and good Garden free.
Application to be made to the MANAGER.

GUILDFORD GASLIGHT AND COKE COMPANY.

WANTED, a good steady Man, capable of undertaking Smith Work and General Repairs at the Guildford Gas-Works. Preference will be given to a man with a knowledge of Service laying.
Applications, stating age, required wages, two references, and endorsed "Blacksmith," to be delivered to the undersigned not later than Tuesday, March 15, 1892.
By order,
WILLIAM LONGWORTH,
Secretary.
Gas Offices, Guildford, March 5, 1892.

IRISH BOG ORE OXIDE OF IRON.

GAS PURIFICATION.

BALE, BAKER, & CO., direct Importers from Ireland. Sample and Price on application.
OXIDE PAINT, SULPHURIC ACID, & Chemicals.
120 and 121, NEWGATE STREET, LONDON, E.C.

SULPHURIC ACID.

JOHN NICHOLSON & SONS, Chemical Works, LEEDS, specially produce this ACID from BRIMSTONE, for making SULPHATE OF AMMONIA of high quality and *good* colour. Delivery in our own Railway Tank-Wagons or Carboys. Highest references and all particulars supplied on application.

OIL for the "Wells" or "Lucigen" Lamps.
HARDMAN AND CO., Miles Platting, MANCHESTER.

COZE'S Automatic Apparatus for CHARGING AND DISCHARGING GAS-RETORTS. For Illustrated Advertisement of this System, see p. 465.
Inquiries should be addressed to THE AUTOMATIC COAL-GAS RETORT COMPANY, LIMITED, 86-88A, LEADENHALL STREET, E.C.

DRAWINGS, Tracings, Specifications, Quantities, &c., prepared by an experienced Engineering Draughtsman. Plans of Works made, copied, or enlarged. Blue copies made. Illuminated Addresses in first-class style. Writings of all kinds, Engrossments, &c.
Address J. L. FEATHERSTONE 173, Fentiman Road, LONDON, S.W.

OXIDE OF IRON FOR GAS PURIFICATION.

JAMES GORDON & Co., Brokers, can offer Cargoes of good quality; also 300 tons of SPENT OXIDE.
Samples and price on application.
Address Borough Buildings, 7, Rumford Street, LIVERPOOL.

PORTER & CO., Gowts Bridge Works, LINCOLN, Engineers, Ironfounders, and Contractors, for the erection of Gas-Works for Towns, Villages Mansions, Manufactories, Collieries, and Isolated Buildings, at home and abroad. Manufacturers of Retorts and Fittings, Condensers, Scrubbers, Purifiers, Valves, &c.; also of Girders, Wrought and Cast Iron Tanks, Iron Roofs, &c.
Telegraphic Address: "PORTER, LINCOLN."

MODELS for Lighting Appliances manufactured to order in any style.
Address MORITZ WEIDLICH, Holbmannstr, 16, BERLIN, S.W.

WANTED, a Foreman Stoker. Wages, 37s. per week. Must be a steady, sober man, and a good carbonizer.
Apply, by letter, to No. 2076, care of Mr. King, 11 Bolt Court, FLEET STREET, E.C.

MESSRS. DEBENHAM, TEWSON, FARMER, and BRIDGEWATER'S MONTHLY LIST of Shops, Show-Rooms, Factories, and Waterside Premises, suitable for the Exhibition and Manufacture of Engineering and other Appliances, may be obtained, free of charge, at their Offices, 80, CHEAPSIDE, E.C.

WANTED, a steady man as Stoker at a Colliery Gas-Works. Will have charge of the Works. Must have experience of Engine and Exhauster. One who can lay Mains preferred. Night man kept.
Apply, by letter, to No. 2075, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

RETORT SETTERS.
FIVE good Retort Setters wanted. Men accustomed to Regenerative Furnaces preferred.
Apply, with references, to No. 2077, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

COUNTY BOROUGH OF SALFORD.
(GAS DEPARTMENT.)

OUTDOOR SUPERINTENDENT.
THE Gas Committee are prepared to receive APPLICATIONS for the appointment of OUTDOOR SUPERINTENDENT.
Applicants must have had the supervision of the laying of Mains and Services of a large Gas Undertaking.
Salary, £150 per annum.
Applications must state age and experience, and be accompanied by three recent testimonials, addressed to the Chairman of the Gas Committee, and delivered to me at the Town Hall, Salford, before Five p.m., on Thursday, March 17.
Canvassing will disqualify.

By order,
SAMUEL BROWN,
Town Clerk.

Town Hall, Salford,
March 1, 1892.

BOROUGH OF CHORLEY.
THE Corporation of Chorley are about to appoint a GAS MANAGER and ENGINEER. The person appointed must devote his whole time to the duties of the office, and will be required to enter into a Bond in the sum of £250 for the due discharge of such duties.
Salary to commence at £250 per annum, with such future advances as the Gas Committee may fix.
The duties of the Gas Engineer do not include the collection of Moneys or Gas-Rents.
Applications, stating age, qualifications, and previous employment, with not more than three testimonials of recent date, to be sent to me on or before Tuesday, the 22nd of March, 1892.

THOS. A. JACKSON,
Town Clerk.

Town Hall, Chorley.

SHEFFIELD UNITED GASLIGHT COMPANY.

WORKS SUPERINTENDENT.
WANTED, by the Directors of this Company, an experienced and competent man to act as SUPERINTENDENT at their Effingham Street Gas-Works. He will be required to reside on the Works, with House, Coal, and Gas free.
The maximum make of Gas at this Station is about 3½ million cubic feet per day.
Applications (marked "Superintendent"), stating age, previous engagements, and salary required, to be made by letter only, addressed to Sir Fredk. T. Mappin, Bart., M.P., Chairman of the Company, Gas Offices, Sheffield, not later than Saturday, March 26, 1892.
Testimonials not to be sent till asked for.

HANBURY THOMAS,
General Manager.

Commercial Street, Sheffield,
March 5, 1892.

RICHMOND (SURREY) GAS COMPANY.
FOR SALE—The Directors invite Offers for a CAST-IRON ANNULAR CONDENSER, suitable for a make up to 750,000 cubic feet per day, which has been taken down to make room for Extensions.
The Condenser is complete with 12-inch Connections and Valves, and will be loaded into Railway-Trucks for removal.

THOMAS MAY,
Engineer and Manager.

Feb. 23, 1892.

GAS-RETORTS FOR SALE.
OFFERS wanted for 28 Retorts, marked A. G. & Co., Sydney, delivered into Barge or Dray West India Dock, by Gibbons, Stourbridge; 6 ft. 10 in. long, 21 in. by 14 in. internal diameter, seven hole, open ended, rounded corner, ⌂ shape.
Address A. W. KNIGHT, Cuckfield, SUSSEX.

HALIFAX CORPORATION GAS-WORKS.
FOR SALE—The following MOUTH- PIECES, made by Tangye Bros., and fitted with Morton's Self-Sealing Lids. Socket Outlets for 5-inch Pipes.
Tenders for the whole, or part, of the Mouthpieces to be sent to the undersigned.
Delivery free on rails, Halifax.
90 ⌂-shaped Mouthpieces, 20 in. by 14 in., with Vertical Outlets.
16 ⌂-shaped Mouthpieces, 20 in. by 14 in., with Outlets inclined to the right.
19 ⌂-shaped Mouthpieces, 20 in. by 14 in., with Outlets inclined to the left.

THOS. HOLGATE,
Gas Engineer.

March 5, 1892.

YSTRAD GAS AND WATER COMPANY.
WANTED, on Hire or Hire-Purchase, One 10-ton RAILWAY TANK-WAGON, suitable for Ammoniacal Liquor. Must be in good condition and guaranteed.
Address F. J. BAYNES, General Manager, 9, Ystrad Road, Pentre, near PONTYPRIDD.

YSTRAD GAS AND WATER COMPANY.
TENDERS are invited for the supply of SULPHURIC ACID. Best quality Brimstone; 160° strength.
Price per ton of 2240 lbs. in Tank-Wagons, delivered carriage free at the Bollryngallt Siding of the Taff Vale Railway, Ystrad.
About 25 tons required to the 31st of December, 1892.
Address F. J. BAYNES, General Manager, 9, Ystrad Road, Pentre, near PONTYPRIDD.

PADIHAM AND HAPTON LOCAL BOARD.
THE Gas Committee invite Tenders for the purchase of the surplus TAR and AMMONIACAL LIQUOR to be produced at the Padiham Gas-Works for One year, commencing March 26, 1892.
Particulars may be obtained from the Manager.
Endorsed tenders must be sent to me not later than Saturday, March 12.

J. R. SMITH,
Clerk to the Board.

Local Board Offices, Padiham,
Feb. 23, 1892.

COUNTY BOROUGH OF SALFORD.
THE Gas Committee invite Tenders for the alteration of a 150 feet diameter GASHOLDER at their Liverpool Street Works.
Full particulars may be obtained on application to the Gas Engineer, Gas Offices, Bloom Street, Salford.
Sealed tenders, addressed to the Chairman of the Gas Committee, to be delivered to me before Five p.m. on March 17 next.

By order,
SAMUEL BROWN,
Town Clerk.

Town Hall, Salford,
March 1, 1892.

COUNTY BOROUGH OF BURNLEY.

TO TAR DISTILLERS.
THE Gas Committee of the Corporation of Burnley invite TENDERS for the purchase of the TAR produced at their Gas-Works during a period of One, Two, or Three years from the 26th of March, 1892.
Approximate quantity produced annually, 3000 tons.
The Tar will be delivered into the Contractor's Boats at the Gas-Works Wharf, on the Leeds and Liverpool Canal.
Tenders, under seal, endorsed "Tender for Tar," stating price per ton, to be sent in, addressed to the Chairman of the Gas Committee, Town Clerk's Office, Town Hall, Burnley, on or before Wednesday, the 9th of March, 1892.

By order,
R. E. FOX,
Town Clerk.

Town Hall, Burnley,
Feb. 20, 1892.

RE W. H. BENNETT (DECEASED).
HAVING made arrangements with the well-known Firm of Patent Agents, Messrs. WHEATLEY & MACKENZIE, of 40, CHANCERY LANE, LONDON, W.C., for carrying on my late husband's Business on my behalf, I shall esteem it a great favour if clients and friends will kindly extend to Messrs. W. & M. the same support they accorded him during the last 30 years.
Messrs. W. & M. will be happy to render every assistance in respect to Patent matters in this or any foreign country. All business communications should be addressed to them direct, and such will receive prompt, personal, and careful attention.

(Signed) EMMA BENNETT.

22, Great George Street,
Westminster, S.W.,
Feb. 15, 1892.

THE Gas Committee of the Leeds Corporation solicit TENDERS for the alteration and enlargement of Six PURIFIERS at the Gas-Works, York Street.
Plan and Specification may be seen, and further particulars obtained, on application to the Resident Engineer, at the Gas-Works aforesaid.
Tenders, endorsed "Tender for Enlargement of Purifiers," will be received not later than Tuesday, the 15th inst., at Twelve at noon, addressed to the CHAIRMAN of the Gas Committee, Municipal Offices, LEEDS.

THE Middleton Corporation Invite TENDERS for increased GASHOLDER accommodation at their Gas-Works, Middleton.
Plans may be seen and Specifications obtained from Mr. Duxbury, Gas Manager, on depositing one Guinea with the undersigned, which will be returned on receipt of tender.
Sealed tenders to be addressed to the Chairman of the Gas Committee, Town Hall, Middleton, endorsed "Gasholder," and to be delivered here on or before the 17th of March, 1892.

FREDERICK ENTWISTLE,
Town Clerk.

Feb. 23, 1892.

ULVERSTON LOCAL BOARD.
(GAS DEPARTMENT.)

TO GASHOLDER MANUFACTURERS.
THE Gas and Water Committee invite TENDERS for the construction and erection of a TELESCOPIC GASHOLDER, 80 feet in diameter, and 20 feet deep.
Drawings and Specifications may be seen, and all information obtained, on application to the undersigned.
The Committee do not bind themselves to accept the lowest or any tender.
Sealed tenders, endorsed "Gasholder," to be sent in not later than the 18th inst., addressed to the Chairman of the Gas and Water Committee.

JNO. SWAN,
Engineer and Manager.

March 5, 1892.

ULVERSTON LOCAL BOARD.
(GAS DEPARTMENT.)
THE Gas and Water Committee invite TENDERS for the construction of a BRICK and PUDDLE GASHOLDER TANK, 82 feet in diameter, and 20 feet deep.
Drawings and Specifications may be seen, and all information obtained, on application to the undersigned.
The Committee do not bind themselves to accept the lowest or any tender.
Sealed tenders, endorsed "Gasholder Tank," to be sent in not later than the 18th inst., addressed to the Chairman of the Gas and Water Committee.

JNO. SWAN,
Engineer and Manager.

March 5, 1892.

Price 2s. per dozen, or 10s 6d. per 100, post free.

CONSPIRACY and Protection of Pro- perty Act. It is required, under a Penalty of FIVE POUNDS, that a Printed Copy of the 4th Section of this Act shall be posted up at all Gas-Works, in a conspicuous place, where the same may be conveniently read by the persons employed thereat.
Printed copies of this Section, in large type, on broad sheets, may be obtained of WALTER KING, 11, Bolt Court, FLEET STREET, E.C.

*** *The Act extends to Scotland and Ireland.*

NOW READY. PRICE ONE SHILLING.

METROPOLITAN WATER SUPPLY.

CONSIDERATIONS AFFECTING THE

ADEQUACY AND CONTROL

OF THE

WATER SUPPLY TO THE METROPOLIS.

BY

E. H. STEVENSON and E. K. BURSTALL, M.M. Inst. C. E.

LONDON: WALTER KING, 11, BOLT COURT, FLEET STREET, E.C.

BOLTON CORPORATION.
(GAS DEPARTMENT.)

TENDERS FOR TAR.

THE Bolton Corporation Gas Department are prepared to receive TENDERS for the purchase of TAR, to be produced at their Gas-Works, for the periods of One, Two, or Three years, dating from the 26th of March.

Approximate quantity, about 5000 tons yearly.

The Tar will be delivered into Contractors' Tanks at the Craddock Lane and Bullfield Sidings, on the Lancashire and Yorkshire Railway, Bolton.

Tenders, under seal, endorsed "Tender for Tar," and stating price per ton of 2240 lbs., and terms, to be addressed to Mr. Alderman Miles, Chairman of the Gas Department, and delivered at the Gas Offices, Bolton, on or before Wednesday, the 9th of March.

The highest or any tender not necessarily accepted.

By order,
R. G. HINNELL,
Town Clerk.

Town Hall, Bolton,
Feb. 26, 1892.

CORPORATION OF BANGOR.

SUPPLY OF GAS COAL.

THE Gas Committee of the above Corporation invite TENDERS for the supply of 3000 tons of GAS COAL, to be delivered at the Bangor Station (L. & N.W. Railway), or by Ship on the Beach. The Beach is well sheltered, and has a good level surface.

The Coal must be of good quality, and capable of yielding not less than 10,000 cubic feet of 16-candle Gas per ton, well screened, and free from Bats, Pyrites, or other Impurities.

Form of Tender, and any information may be had on application to the undersigned.

Tenders, with copy of Analysis, to be sent to E. S. Owen, Esq., Borough Accountant, on or before the 21st inst.

The Committee do not bind themselves to accept the lowest or any tender, and reserve to themselves the right to divide the contract between two or more Firms.

JOHN SMITH,
Manager.

Bangor, March 5, 1892.

Now Ready, Price 6s., Bound in Cloth.

THE CHEMISTRY OF ILLUMINATING GAS,

By

NORTON H. HUMPHRYS, Assoc. M. Inst. C.E., F.C.S.

This work contains chapters on: The Relative Cost of Light from Gas, Oil, and Candles; Products of Combustion; The Sulphur Question; The Composition of Illuminating Gas; Water Gas; Various Gas-Making Processes; Oil Gas; Properties of Fluid Hydrocarbons; Tar for Gas-Making; Destructive Distillation; Condensation; and Purification.

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Practical Photometry.

By William Joseph Dibdin, F.I.C., F.C.S.,

Chemist and Superintending Gas Examiner to the London County Council.

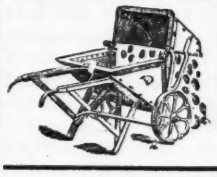
LONDON:
WALTER KING, 11, Bolt Court, FLEET STREET, E.C.

L. MONK & CO.,
Cannel and Gas Coal Merchants,
34, ST. ANDREW SQUARE,
EDINBURGH.

ROBERT MARSHALL,
CANNEL COAL MERCHANT,
97 WELLINGTON STREET, GLASGOW.

Prices and Analysis of all the Scotch Cannels on application.

PRICE'S PATENT COKE & COAL BARROW



effecting a great saving of time, labour, and expense.

For particulars, price &c., apply to Mr. E. PRICE, Inventor and Patentee, 22, Alwyne Road, Canonbury, LONDON, N.

Prices are Reduced.

To effect a great saving in
GAS-FURNACES use our
Special Derbyshire **GANNISTER BRICKS.**
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ALBERT WORKS, WIDNES.

JAMES OAKES & Co.,
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AND
Wenlock Iron Wharf, 21 & 22, Wharf Road,
CITY ROAD, LONDON, N.

Manufacture and keep in Stock at their Works (also large stock in London)
PIPES and CONNECTIONS, 1¼ to 48 inches in diameter; and make and erect to order RETORTS, PURIFIERS and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas Water, Railway, Telegraph Chemical, Colliery, and other Companies.

NOTE.—Makers of HORSLEY'S PATENT SYPHONS. These are cast in one piece, without Chaplets; doing away with bolts, nuts, and covers, and rendering leakage impossible.

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CAST-IRON PIPES
FOR GAS AND WATER.
Pipes, One to Six inch Bore, kept in Stock. Also a very large assortment of all sizes of Bends, T-pieces, and Specials ready for despatch on receipt of Order.

VALVES
FOR GAS, WATER, AND STEAM.

TELEGRAMS: "PIPES GLASGOW."
WM. MACLEOD & CO.,
56, ROBERTSON STREET, GLASGOW.

THE SILICA FIRE-BRICK COMPANY,
OUGHTIBRIDGE, near SHEFFIELD,
MANUFACTURE
SILICA BLOCKS, BRICKS, AND CEMENT
OF SUPERIOR QUALITY
FOR GAS-FURNACES.

Trade Mark: "SILICA."

These Goods (largely used in Gas, Glass, Iron, and Steel Works) are, on account of their
GREATER DURABILITY,
Strongly recommended where EXCESSIVE HEATS have to be maintained.

WALLER'S PATENT FOUR-BLADE GAS EXHAUSTER,
From 40,000 to 250,000 feet per hour.
WALLER'S PATENT THREE-BLADE GAS EXHAUSTER,
From 5000 to 35,000 feet per hour.
WALLER'S IMPROVED BEALE GAS EXHAUSTER,
From 1000 to 250,000 feet per hour.
WALLER'S Patent WASHER-SCRUBBER & Tar Extractor Combined
FITTED WITH
WOOD CLUSTERS for efficiency and LIGHTNESS.
WALLER'S Patent Combined GAS ENGINE and Exhauster,
With Disc Valves, Bye-Pass Valve, Throttle Valve, and Regulator, all Complete on One Base Plate.
Machinery for Elevating and Conveying Coal, Coke, Oxide, Lime.

G. WALLER & CO., ENGINEERS, FOUNDERS, BOILER MAKERS,
58, PARK STREET, SOUTHWARK, & STROUD, GLOUCESTERSHIRE.

TROTTER, HAINES, & CORBETT,

Brettell's Estate

FIRE-CLAY & BRICK WORKS,

STOURBRIDGE.

Manufacturers of GAS-RETORTS, GLASSHOUSE FURNACE & BLAST-FURNACE BRICKS, LUMPS, TILES, and every description of FIRE-BRICKS.

Proprietors of

BEST GLASSHOUSE POT & CRUCIBLE CLAY.

SHIPMENTS PROMPTLY AND CAREFULLY EXECUTED.

MARKS & RUSSELL,

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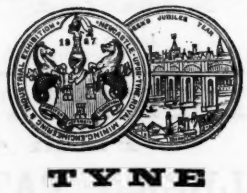

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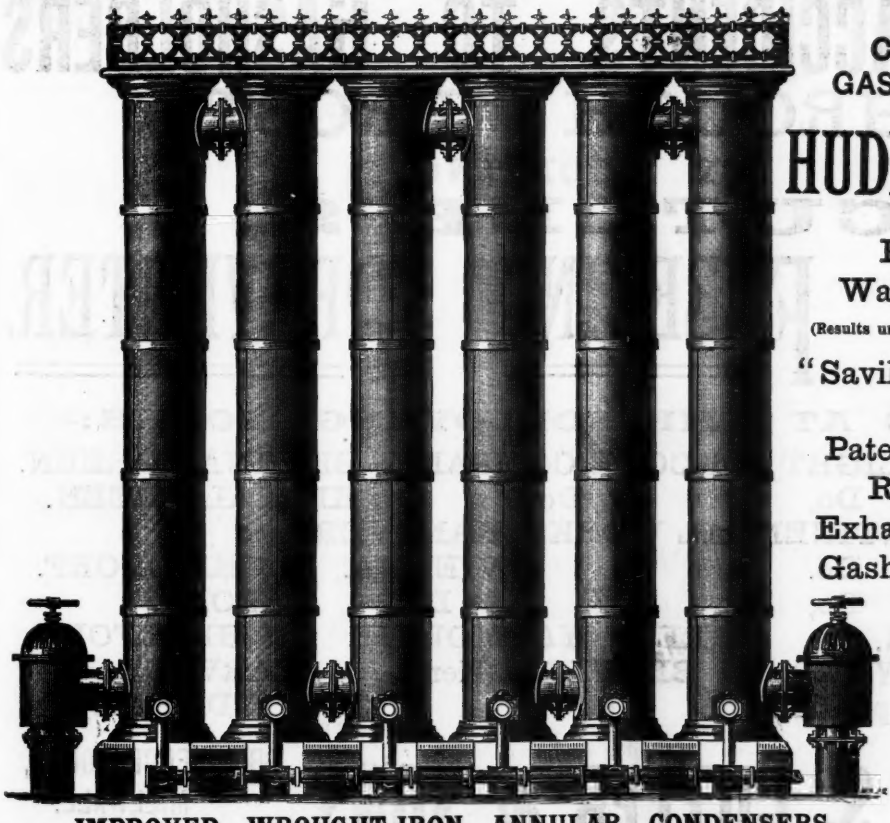

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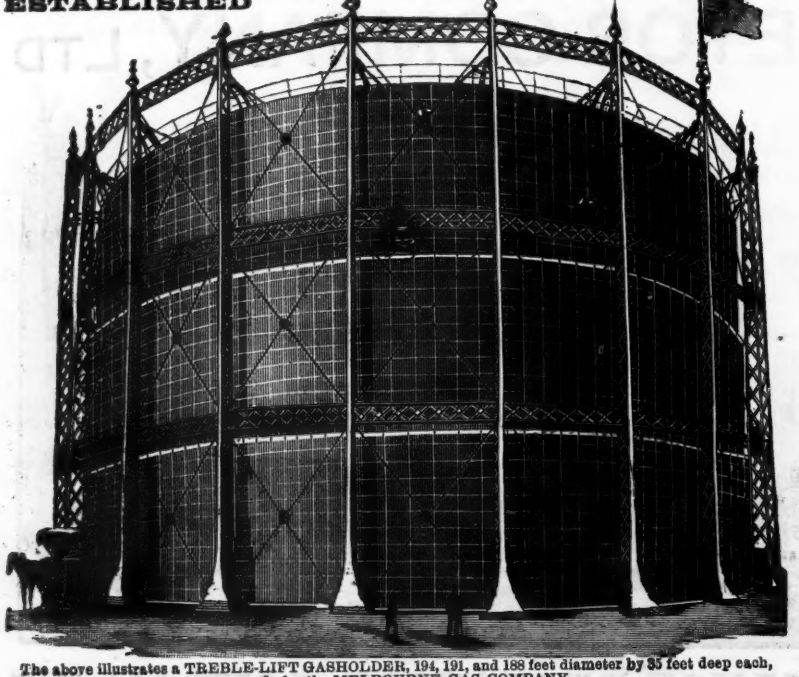

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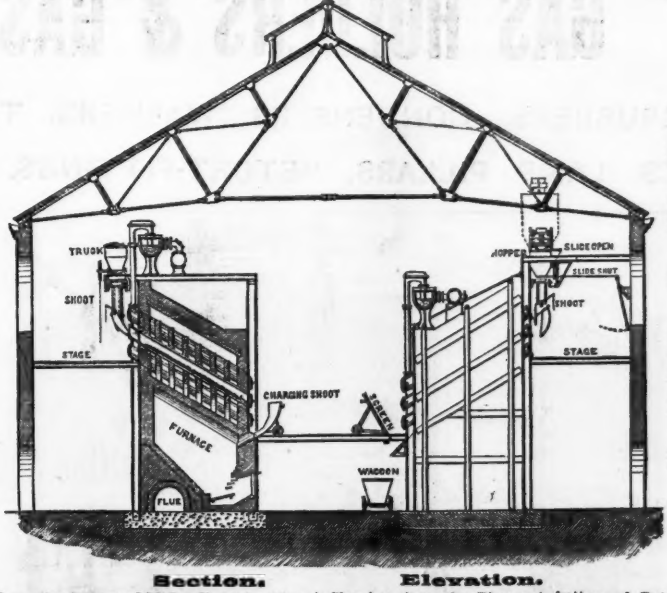

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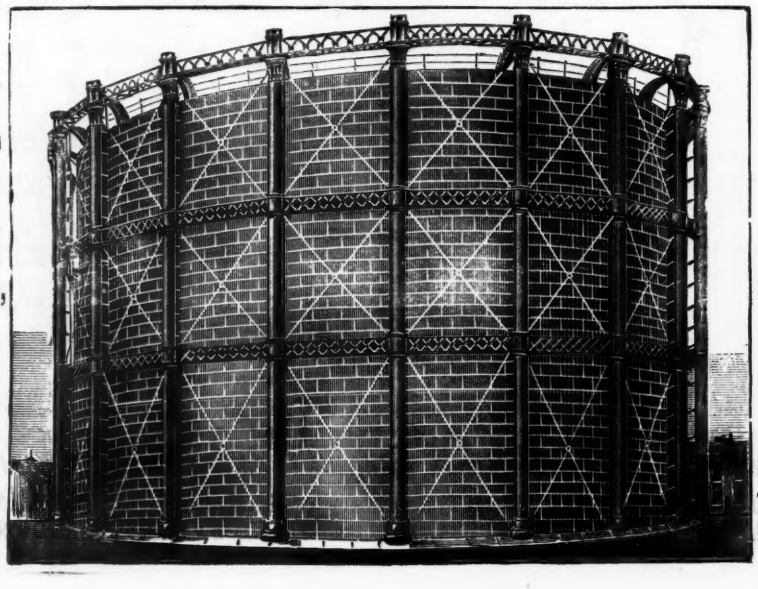

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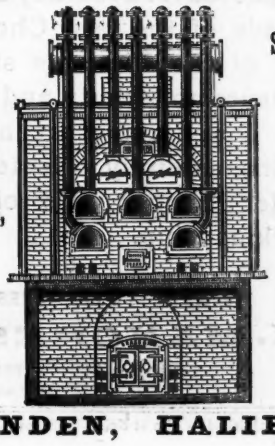

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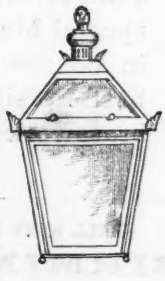

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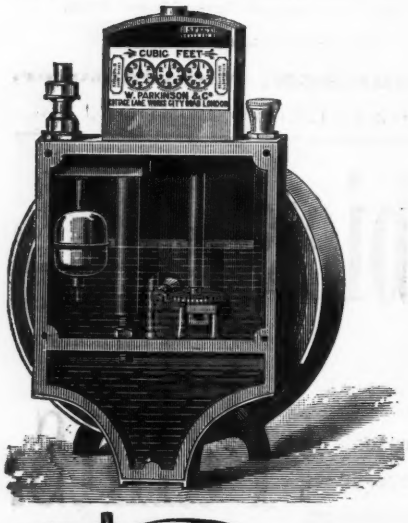

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[See also Advt., p. 430.

London: Printed by WALTER KING (at the office of King, Sell, and Railton, Ltd., 12, Gough Square); and published by him at No. 11, Bolt Court, Fleet Street, in the City of London.—Tuesday, March 8, 1892.